



INNOVATION MODELS AND THEIR
APPLICATION FOR DEVELOPING
COUNTRIES: CASE-STUDIES FROM
AGRICULTURAL (CATTLE) DEVELOPMENT
IN RURAL KAZAKHSTAN

Dissertation thesis

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Rok: 2018

Declaration

I hereby declare that I elaborated this dissertation thesis independently using the cited literature

In Prague, 17th November 2017

Acknowledgements

I would like to thank the Czech Republic for giving me such a unique opportunity to study and live in the country for 10 years. During this time, I have obtained Bachelor and Masters degrees from the Faculty of International Relations, and a PhD degree from the Faculty of Economics at the University of Economics, Prague. My special thanks go to doc. Ing. Martin Pělucha, Ph.D. for valuable comments and suggestions raised during the compilation of this dissertation thesis, the former head of the Department of Institutional, Environmental and Experimental Economics Mgr. Ing. Miroslav Zajíček, Ph.D., M.A. for guiding me through the academic university life and doc. PhDr. Ing. Ing. Petr Jakubík Ph.D. Ph.D. for showing me the art of writing academic articles. I would also like to thank all teachers and colleagues that I met during my studies and conferences. Finally, I want to dedicate this thesis to my father who always believed in me and unconditionally supported me throughout my entire life.

Introduction

A common feature of the top ten most innovative countries according to the 2016 Global Innovation Index is an extensive collaboration between various actors within their Innovation Systems at national and regional levels. Currently, the existing literature focuses mostly on innovative development in developed countries (Asheim 1997, 2003, Doloreux 2002a, 2004). This thesis contributes to the debate on innovation to enhance small and medium-holder sustainable agricultural development in developing countries, taking the Republic of Kazakhstan as an example.

The need to stimulate the innovation of small and medium-holder agricultural (agricultural SMEs) development in developing countries is receiving attention on the development agenda because the sector remains central to the achievement of sustainable development (World Bank 2006). The renewed interest in innovation is unfolding in a fast-evolving context in which many facts and actors are driving small and medium-holder agricultural development. Firstly, there is climate change that leads to an increase in agroecosystem degradation and negatively impacts rural communities (Schut et al. 2011, Ewing and Msangi 2009). Secondly, there are persistent production related issues of small and medium-sized farmers that reduce food security and lead to increases in food prices (Hounkonnou et al. 2012). Thirdly, there are growing opportunities but with challenges to connect small and medium-sized farmers with national and international market chains, wholesalers and large-scale processors (Ochieng 2007, Vorley et al., 2007, and McCullough et al. 2008). The opportunities are through technological advancements, changes in innovation support and knowledge structures with diverse public and private stakeholder engagement and involvement in the sector (Juma, 2011, Sulaiman et al. 2012, Hall et al. 2002).

Leeuwis and van den Ban (2004) argue that innovation is not an isolated process; it requires coordinated actions and efforts in a network of independent stakeholders. Nonetheless, as the World Bank (2006) study on enhancing innovation among agricultural SMEs revealed, even with the presence of strong market incentives to encourage innovation, there is a lack of interest among various actors to cooperate. The paradigm of this thesis is the role of innovation processes in public expenditure programmes in the agricultural sector.

The lack of interaction among key actors in the agricultural sector is very apparent in the Republic of Kazakhstan because of numerous systemic failures (Sarsembayev 2007, Satpayev 2006, Rahimov 2007), which can be widely characterised as institutional, infrastructural, interactional and capability failures (Klein-Woolthuis et al. 2005).

Hence, addressing the innovative development of agricultural SMEs has in recent decades become a core policy in Kazakhstan. Small firms require special attention due to specific features that influence their innovation levels including excessive bureaucracy, lack of managerial capabilities, inadequate access to external knowledge sources, low entrepreneurial spirit, lack of ability to respond to unexpected developments in the field, and inflexibility (Pio 1994, Carayannis 2005, Saad et.al. 2008).

This thesis presents the results of an exploratory study of the innovative capacity of SMEs through their interactions with government, knowledge institutions and other public agencies to facilitate networking and access to funding sources, as well as to encourage knowledge acquisition processes. The main stakeholders are in Aktobe region in the western part of Kazakhstan.

The farming population of Aktobe region is dominated by agricultural SMEs that are particularly active in various agriculture sectors with very limited technological and R&D capacity. These enterprises have specific knowledge requirements that are largely unserved by national educational institutions and government agencies despite many recent and ongoing small enterprise-oriented initiatives, many of which are often inappropriately tailored to the more general requirements of SMEs. The causes for this include insufficient awareness of the specific features and problems of agricultural SMEs among government agencies, poor communication between the parties, insufficient information available to experts responsible for such government programs (in terms of scopes, benefits etc.), high levels of bureaucracy and overlapping responsibilities between the enterprise-support mission and government agencies.

Drawing upon the case studies, this thesis attempts to identify governance activities relevant to industrial and innovative systems for agriculture in developing countries, and discusses the related policy issues, lessons, and recommendations emerging from the case studies. A main hypothesis of this case study is that a well-functioning industrial and innovative system critically depends on how well Kazakh national and regional government can bring together

and coordinate the activities of different actors and stakeholders for advancing competitiveness in the agricultural sector of the economy. The thesis therefore:

- outlines the Kazakh approach to agricultural policy-making and analyses the main policy documents;
- analyses financial, institutional and policy support for further sustainable development of Kazakh beef sectors and examines the effectiveness of official policy responses to address these challenges;
- analyses mechanisms for implementing agricultural extension services.

The following overarching research questions are drawn from the objectives that guide the preceding chapters:

- What is the policy approach for, and the role of the government in agricultural development?
- What are the main causes of inefficiencies in state support?
- How do extension services support innovation processes and what are their potential contributions to the outcomes of these processes?

In the first case study, I carry out an assessment analysis of some of the farm-level constraints to the further development of Kazakh beef sectors and examine the effectiveness of the official policy response to address these challenges. The case study contains original analysis of some actual constraints to agricultural development based on my survey of five districts of the Aktobe region in north-west Kazakhstan during the summer of 2016. Based upon 69 survey respondents, who comprise 52 percent of the total number of agricultural farms in the Aktobe region, I assessed farmer accessibility to key production factors such as fodder, land, and capital. The respondents were selected based on unique data collected during the field research organised by the Aktobe Regional State University named after K. Zhubanov and the Municipality of Aktobe since October 2012. I also provide survey results from face-to-face interviews with local farmers with emphasis on the production and marketing structure of the beef sector and new development trends, as well as a discussion on shortcomings in the current “Agriculture 2020” strategy. This is accompanied by policy recommendations based on the findings. In the second case study, I explore the local conditions for agricultural extension services in Aktobe region. I conduct a survey of “Damu Business Development

Fund”, which is among other activities engaged in extension service activities in the region. The aim of the research is to understand the experience of farmers with extension services provided by the “Damu” centre, as well as issues faced by the extension administrators in addressing farmers’ needs.

1 Analysis of selected major theoretical–methodological approaches

The main objective of this chapter is to examine the functions of regional innovation systems, specify desirable mechanisms for promoting competitiveness and innovation, and assess the respective policy implications. The study provides a state-of-the-art review with respect to conceptual application for regional innovation systems with a focus on developing countries.

1.1 Innovation Systems: A Critical Review

The importance of the regional scale and specific regional resources in stimulating the innovation capacity and competitiveness of firms and regions is recognised by many academics (Malmberg and Maskell 2002, Isaksen 2002, Wolfe 2004, Cook 2002, Asheim et al. 2003). The concept of regional innovation systems starts to receive greater attention as a promising framework of advancing understanding of the innovation process in regional economy.

The concept has no commonly accepted definition yet (Doloreux, 2003). Nonetheless, the origin of it is based on two main bodies of theory and research. The first body of literature is the systems of innovation. It is based on evolutionary theories of economic and technological change (Edquist 2004). Dosi (1988) argues that various external and internal factors and actors influence and encourage the process of innovation. Cook (2002) emphasise the social aspect of innovation and reference it to the process of collective learning between different departments within a company, external cooperation with other companies, and knowledge providers. The second body of literature discusses the socio-institutional context of innovation. Kirat and Lung (1999) argue that the literature of regional studies focuses on two different factors, the role of proximity, such as the benefits that can be derived from spatial concentration or localization advantages; and territorial prevailing sets of conventions, rules and norms through which the process of knowledge production and dissemination occurs.

The concept of regional innovation systems emerged when policy-makers began to focus on systemic promotion of localised learning processes to secure regional competitive advantages (Asheim and Gertler 2004). The policy-makers maintained targeted policy measures within the framework of the regional innovation system to promote performance and capacity

development of local firms and their business environment. Cooke (1998) emphasises the importance of the process of interaction among various innovative actors. He (1998) argues that the interactions contain localised processes of interactive learning among a wide spectrum of actors, such as the business community and government agencies. Meanwhile, Andersson and Karlsson (2002) argue that the policy strategy can have an impact on the regional innovation system, while the development of regional comparative advantages is directly linked to specific regional resources (Maillat and Kébir 2001).

Outlook on Agricultural Innovation Systems in Developing-Country

Theories of technological change in the agriculture sector received great attention during the second half of the 20th century (Lipton 1989, Huffman and Evenson 1993, Norton and Pardey 1995, Echeverria 1990, Hazell and Haddad 2001). One of the main research areas of the studies was the public research organizations in the agricultural sector that were later transformed into the national agricultural research systems. Scholars argued that the public nature of agricultural research and lack of purchasing power among agrarian agents gave the government a greater role in technological change promotion. They referred to it as linear knowledge production culture (Mode 1 knowledge production model), where the government stimulates interaction between academia and farmers, and knowledge production flows in one direction, which is from scientific researchers to farmers, while other institutions (legal, social, economic, etc.) are exogenous.

Röling (1986, 1988) addressed some conceptual gaps in the Mode 1 knowledge production model that prevent analysis of knowledge flow between researchers and end-users by emphasising the links between education, research, extension in producing knowledge, and promotion of technological change. Mode 1 faces major obstacles to conduct analysis beyond the nexus of university research, public sector research, and extension services due to the heterogeneity of actors in the knowledge production model. Therefore, it is important to take into consideration their historical and institutional development, which determines their behaviour and learning process, to enable them to continuously innovate and change.

Great discussions on knowledge production models and learning processes in developed countries have been extended to developing countries. Biggs and Clay (1981) argue that the process of innovation happens during institutional learning and institutional changes. Hence, they proposed to study the link between institutional milieu and the process of innovation

more carefully. Their concept received wide attention and recognition in innovation systems studies of agriculture in developing countries, and is referenced in the studies of Hall et al. (1998), Clark (2002), Arocena and Sutz (2002). Also, there are case-studies of selected countries, e.g. Sumberg (2006) and Hall and Yoganand (2004) studied innovation systems in Sub-Saharan Africa, Hall et al. (1998) conducted the research based on evidence from India, and Vieira and Hartwich (2002) from Latin America. There is also research done on institutional arrangements in innovation and research, for example contract farming in South Africa (Porter and Phillips-Howard 1997), public-private partnership in agricultural research in India (Hall et al. 2002), producers' associations in Sub-Saharan Africa and South Asia (Hall et al. 1998, Kangasniemi 2002), and exploration of technology opportunities (Ekboir and Parellada 2002). Hall et al. (2002) conducted an in-depth study of the organisational and institutional learning processes to promote fund diversification of agricultural research in India and introduce new actors (medium-sized firms and producer cooperatives) and new modalities (public-private partnerships and contract research). Hall et al. (2003) studied institutional learning and change processes that were incorporated into project design in post-harvest packaging for small-scale farmers in Himachal Pradesh, India. Ekboir and Parellada (2002) offer a detailed analysis of economic and social changes to support diffusion of zero-tillage cultivation in Argentina.

The literature on knowledge production models and learning processes in developed and developing countries has been rapidly developing and has covered various aspects of the problem since the introduction of Mode 1. To date, these discussions have led to a question of development and interaction of the actors within the complex system of innovation, which varies depending on the contexts of institutional milieu and process of innovation.

1.2 The Triple Helix and its applicability to developing countries

The multidimensional perspective of a helix system - the Triple Helix system (Leydesdorff 1997) was introduced by the governments of developed countries (Turpin et al. 1993, Etzkowitz and Mello 1994, Shinn 1997) with the purpose of promoting collaboration between science and industry (i.e. Double Helix). Later it was argued that such collaborations create greater benefits through the knowledge spillover (Marshall 1982).

Successful cooperation of science and industry in the Western world made scholars question possibilities to import the Triple Helix concept to developing countries. A new Triple Helix paradigm became a new concept for Brazil (Maculan and Carvalho de Mello 2010), India (Datta and Saad 2011), and Indonesia (Irawati and Rutten 2011), etc. Despite implementing the same or similar steps to establish knowledge production models and learning processes as developed countries did in the 1990s (Chaminade et al. 2011), progress was slow in developing countries. Calestous and Yee-Cheong (2005) provide a comprehensive summary of the main factors impeding the process such as undeveloped productive forces, presence of remnants of patriarchal and tribal relations, dependence on former colonial powers, and complex relations between different regions and ethnic groups within them.

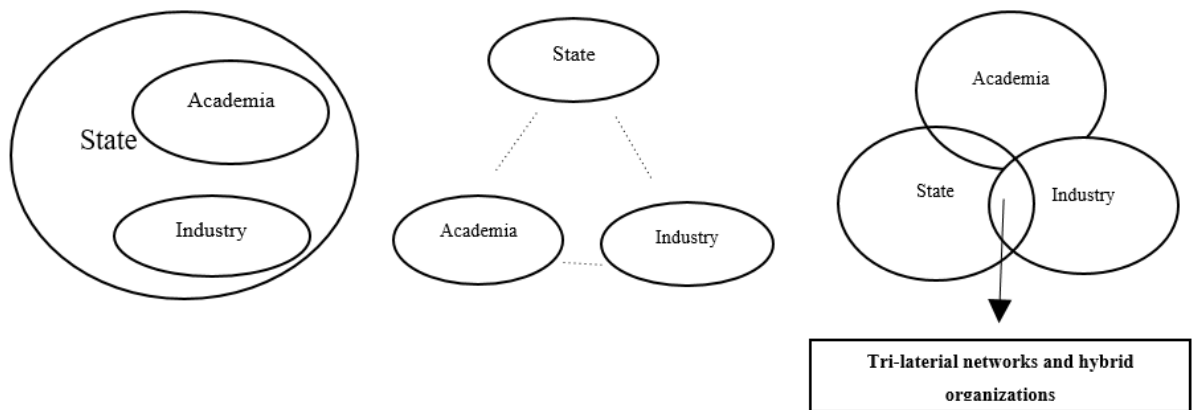
Therefore, the implementation of a helix model in developing countries is complex process and successful experience of developed countries is insufficient to establish knowledge production models and learning processes. The following chapter analyses the construction and varieties of the Triple Helix models developed to date to investigate how to improve competitiveness and innovation capacity of farmers considering the regional specialization thought the analysis of Quadruple and Quintuple Helixes (Carayannis, Barth, and Campbell 2012)

A Glance at the Triple Helix

The Triple Helix thesis emerged after the introduction of working paper “The Triple Helix-University-Industry-Government Relations: A Laboratory for Knowledge-Based Economic Development” written by Etzkowitz and Leydesdorff (1995). During the mid-1990s universities and industry were exhorted by policy makers to collaborate for the commercialization of new knowledge (Branscomb 1993).

Scholars believe that transformations happen within the Triple Helix (TH) through endogenous dynamics such as science-based innovations and inventions (Whitley 1984), regulation and legislation implemented by national and regional governments (Freeman 1987, Freeman and Perez 1988). Also, literature on the TH suggests that it is possible to study only two out of three dynamics, for example, just to analyse university-industry relations (Etzkowitz 2002), nonetheless the third dynamic of organised knowledge production has to be considered as one of source of variation (e.g., Carayannis and Alexander 2000).

Figure 1. Three type of Triple Helix configurations



Source: Freely reposted from Etzkowitz and Leydesdorff (2000), p. 4

It is broadly viewed by scholars that the literature on the TH has been developed within two decades: neo-institutional and neo-evolutionary perspective (Carayannis and Campbell 2009).

The neo-institutional perspective distinguishes three main configurations through the positioning institutional spheres of Triple Helix actors.

- The **‘Statist’** configuration can be characterised by the leading role of the government. It encompasses academia and industry, and regulates relations between them. A similar version to this model can be found in the CIS countries and China.
- The second, so-called **‘Laissez-faire’** policy model is driven by industry, and government interventions are limited. The potential for innovation in such a model is also limited, similar to the first configuration, because here universities just provide skilled human capital and cooperation among Triple Helix actors are circumscribed with strong borders.
- The third model is called a **‘Balanced’** model, which is specific to the nations in transition to **‘Knowledge Societies’**. In this model, all actors of the TH - university, industry and government act in partnership, thus generating an infrastructure of knowledge and sometimes taking the role of one another by creating hybrid organizations as their functions are interfaced.

The neo-institutional arrangements of TH models can be used as a tool for social network analysis (Owen-Smith et al. 2002, Powell et al. 2005). For example, Godin and Gingras

(2000) and Shinn (2002) discovered new functions and roles of universities through the analysis of knowledge-based configurations in different regions, sectors, and countries, which later led to the introduction of a new notion, “**entrepreneurial universities**” (Clark 1998, Mirowski and Sent 2007). Interaction within the TH’s interfaces leads to transformation of the initial position of actors. The relations of TH’s actors are continuously reshaped in ‘an endless transition’ and are induced by new technologies such as ICT. (Etzkowitz and Leydesdorff 2000). The analysis of these transformation processes is a role of neo-evolutionary mechanisms.

The Neo-evolutionary perspective considers the TH’s actors as co-evolving subsets of social systems (Ahrweiler et al. 2011, Windrum 1999). The forms of interactions between them consists of two processes: **communication** and **differentiation** (Ivanova and Leydesdorff 2014, Pyka and Scharnhorst 2009). Both forms create institutional spheres at the level of university, industry and state and the degree mutual adjustment are under public and private control (Leydesdorff and Etzkowitz 1998). The internal differentiation within an institutional sphere is a catalyst for generation of new types of structures and links connecting different spheres (Etzkowitz et al. 2000). The institutional spheres have functions of selective mechanisms, which generate an innovative environment and ensure the ‘regeneration’ of the system (Leydesdorff and Etzkowitz 2000). The interactions between various helices create “self-organised” systems. These systems are developed within a specific environment.

In the last few decades the governments, universities and industries in developing countries were widely criticised for letting their former industries of national importance head to oblivion (Arocena 2005, Carayannis and von Zedtwitz 2005) and did not manage to create an enabling environment for a launching mechanism of generating knowledge-based jobs (Pio 1994, Saad 2008 et. al.).

Meanwhile, in developed countries, the Triple Helix has matured in bringing the key players closer over the years. Long-term experience made them recognise the crosscutting issues that none of them can adequately deal with individually, e.g. social and physical infrastructure.

Governments of the middle-income countries typically stimulate collaboration between universities and enterprises by creating demand, signing annual performance contracts, and infrastructure provision. It is not an easy process to initiate collaboration (Carayannis 1999,

2008 and 2009). However, literature (Almeida 2005, Atkinson 2007) has shown that it is the only way for a sustainable competitive economic growth, which is mutually beneficial.

Lack of interaction between government, universities and industries can create the major financial losses that could be used to discover new business opportunities (Leydesdorff and Sun 2009). Moreover, it is argued that the TH is insufficient in long-term sustainable innovative growth (Khan and Al-Ansari 2005) and is required to be revised.

The next section discusses the Quadruple and Quintuple Helixes.

Models of innovation dynamics

The Quadruple Helix model is based on the Triple Helix model, and additional fourth helix, which represents ‘Public’. Public is defined as the ‘**media-based and culture-based public**’ or **civil society**. Carayannis and Campbell (2009) argue that it plays an important role in setting and achieving goals and objectives, because ‘public’ or ‘civil society’ is influenced by culture and values, and communicates its values through the media. Hence, the innovation policies and strategies should reflect the dynamics of “*media-based democracy*” (Carayannis and Campbell 2009 p. 218).

In comparison to the rest of the helices, ‘public’ plays a prominent role in terms of defining the needs and demand of a social group (Lindberg et al. 2012). Fuzi (2013) argues that the fourth helix could be considered as a group of innovative actors or initiators contributing to integrated innovative system. Arnkil et al. (2010) suggests four different types of quadruple helix models:

- 1) The “**TH + user model**” is based on the traditional TH model and the fourth helix is represented by a user or consumer that provides and generates new ideas and information for improvement of products and services in demand.
- 2) Industry and private sector are holders of innovative progress in the “**Firm- centered living lab model**”, while the rest of traditional helices still play an important role in the process.
- 3) “**Public sector-centered living lab model**” focuses on improvement of public services. The fourth helix is a public organisation, and produces improved products and services for society.

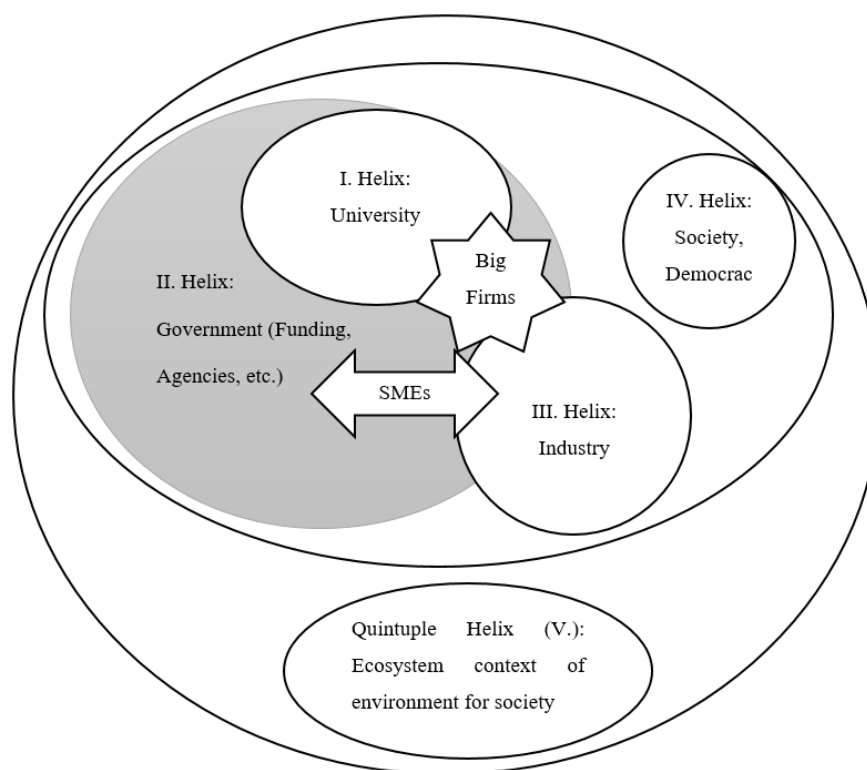
4) Community and society play a main role to initiate the innovation for their own stake in the **“Citizen-centered model”**.

Aside from active civil society, the resource of knowledge that circulates between social sub-systems critically affects the innovation process. The Quadruple Helix, therefore, presents the collective interaction and exchange of knowledge by means of the four sub-systems, such as the educational system, economic system, media-based and cultural-based public, and the political system (Carayannis, Barth and Campbell 2012). Interestingly, an alternative but similar approach to the Quadruple Helix model is offered by Niklas Luhmann. His theory of the system raises questions about how society is organised on the macro-level in the above-mentioned functional sub-systems.

The Quadruple Helix brings on new facts that were not taken into consideration in TH. The additional helix (“public”) makes the model more responsive to current needs of knowledge society and supports democracy. To summarise the findings, one may conclude that TH has a rather top-down approach of governance, while QH is a combination of top down policies and practices, bottom-up and mid-level out civil society grassroots actions and initiatives, which makes cooperation among the traditional helices more comprehensive.

Figure 2 presents a model of innovation dynamics that attempts to accommodate different existing models in a way that has not been explored before. This approach helps to clarify the positioning of the existing models in the innovation system of the Republic of Kazakhstan. For example, there are several existing stakeholders of the innovation systems: universities, industry, government, extension centers, funding agencies and civil society. These stakeholders help identify the perspectives, proximities and functioning of differing models and their differentiators. Therefore, in the Quadruple Helix Model civil society plays a key role in promotion of democratic approach to innovation (Carayannis and Campbell 2012), and environmental issues emphasised by the Quintuple Helix (Carayannis and Campbell 2014).

Figure 2. The Quadruple and Quintuple Helix innovation systems in relation to society, economy, democracy, and social ecology in Kazakhstan



Source: Own elaboration with an inspiration of Carayannis and Campbell 2014

In countries with transition economies, especially the CIS, the primary mission of universities is to provide educational services to their population (Smirnova 2014). Even though during the Soviet time science was developing intensively, universities were not the primary source of new knowledge (Smirnova 2015).

The Triple Helix of university–industry–government interactions is established in developed countries. To adjust the model to become a reasonable concept for developing countries, such as Kazakhstan, it is necessary to adjust the concept of the TH to local realities. Kazakh universities are bound to succumb to the orientations and perspectives of government legislatures and at times, in the case of Kazakhstan, presidential directives (see figure 2). Kazakh universities are still fully financed from the budget of government with their activities directed by their spending power. Moreover, cooperation between universities and big enterprises of national importance is quite common in Kazakhstan. However, *due to the focus of the thesis on SMEs, the analysis of the role of universities within the framework of applied Quadruple and Quintuple Helix innovation systems in developing countries is not considered.*

Architecture of Innovation Process

Etzkowitz and Leydesdorff in 2000 highlighted that the TH overlay provides a model of ‘**trilateral networks and hybrid organizations**’ that explains the structure of knowledge production of Mode 2 and its relation to Mode 1. Mode 1 refers to university knowledge production that *‘focuses on the traditional role of university research’*. In an elderly “**linear model of innovation**” understanding and success in Mode 1 is defined as *‘a quality or excellence that is approved by hierarchically established peers’* (Carayannis and Campbell 2010, p. 48).

Figure 3. Model of linear innovation modes



Source: Own elaboration with inspiration of Carayannis and Campbell (2012, p. 25)

The linear model (Mode 1) is a “market pull” or “technology push”, and according to Leydesdorff and Etzkowitz (2000), it is insufficient to induce transfer of knowledge and technology. Mode 2 in comparison to Mode 1 has set closer ties between the producer and the final user during the whole process of knowledge creation, and is based on the following principles (1) ‘knowledge produced in the context of application’; (2) ‘transdisciplinarity’; (3) ‘heterogeneity and organizational diversity’; (4) ‘social accountability and reflexivity’; (5) and ‘quality control’.

Figure 3 presents Mode 3, which highlights parallel processes, where basic, applied and experimental research is carried out simultaneously, and academia or educational institutions operate in accordance with principles of Mode 1 and Mode 2 (Carayannis and Campbell 2012, p. 24).

Figure 4 presents the model of nonlinear innovation modes, where basic research is directly linked to market application, and the time horizon for the R&D cycle is shortened as

feedback is provided. The figure also presents two important notions: ‘academia firm’ and ‘entrepreneurial university’.

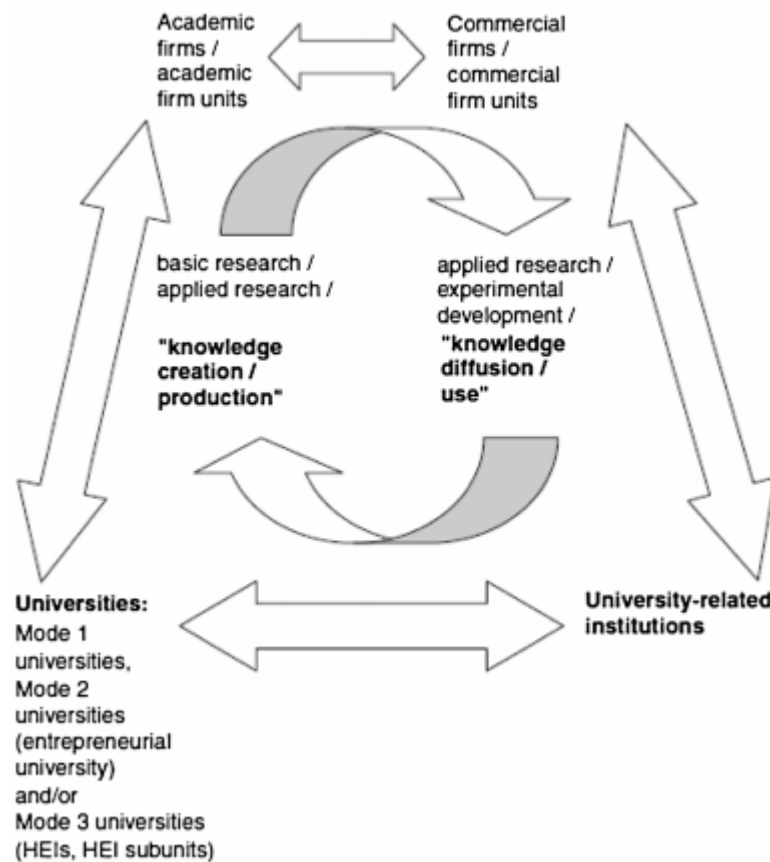
According to Juan Mulet, one of the main responsibilities of the ‘**entrepreneurial university**’ is to help the transition process from research invention to industrial property rights or tradable goods. Clark (1998) names five main features of the ‘entrepreneurial university’:

- (1) a stronger central direction
- (2) extended developmental periphery
- (3) the diversification of funding
- (4) room for a stimulated academic core
- (5) integration of an innovative culture.

According to Campbell and Carayannis (2010), the ‘**academic firms**’ approach has a more decentralised approach in comparison to the previous. It follows the logic of both linear and nonlinear innovation models, and a nonlinear innovation model encourages creative organizational designs (Campbell and Carayannis, 2012). Both the ‘academic firm’ and ‘entrepreneurial university’ approaches share similar features. They were established by merge functions of other institutions. This means that a firm-based organisation can engage in different technology life cycles, and at different levels of technology maturity, and accept cross-employment of their employees with other institutions (Campbell, 2011). Also, it demonstrates how industry (firms/farms) and educational institutions (universities) adopt characteristics of each other, which is one of the main features of Mode 3. According to Mair (2009), a main obstacle to boost cooperation between academia and industry is to overcome the cultural gap and build trust. At the same time, there is a great motivation to cooperate from both sides, especially business. Ray (2000) suggests that business must find, assimilate and exploit knowledge to survive in the long run. Hence, encouraging personnel mobility between the sectors can help the cooperation and learning process. The Mode 3 Knowledge Production Systems concept extends and complements the previous Modes 1 and 2 of Knowledge Production. It is the knowledge production system architecture that allows for efficient and effective *learning, learning to learn and learning to learn how to learn in a multi-lateral, multi-nodal, multi-modal and multi-layered manner* (Carayannis 1994, 2001

and 2008. It differs from the previous modes by being more reflective and transformative in relation to knowledge exchange.

Figure 4. Model of non-linear innovation modes

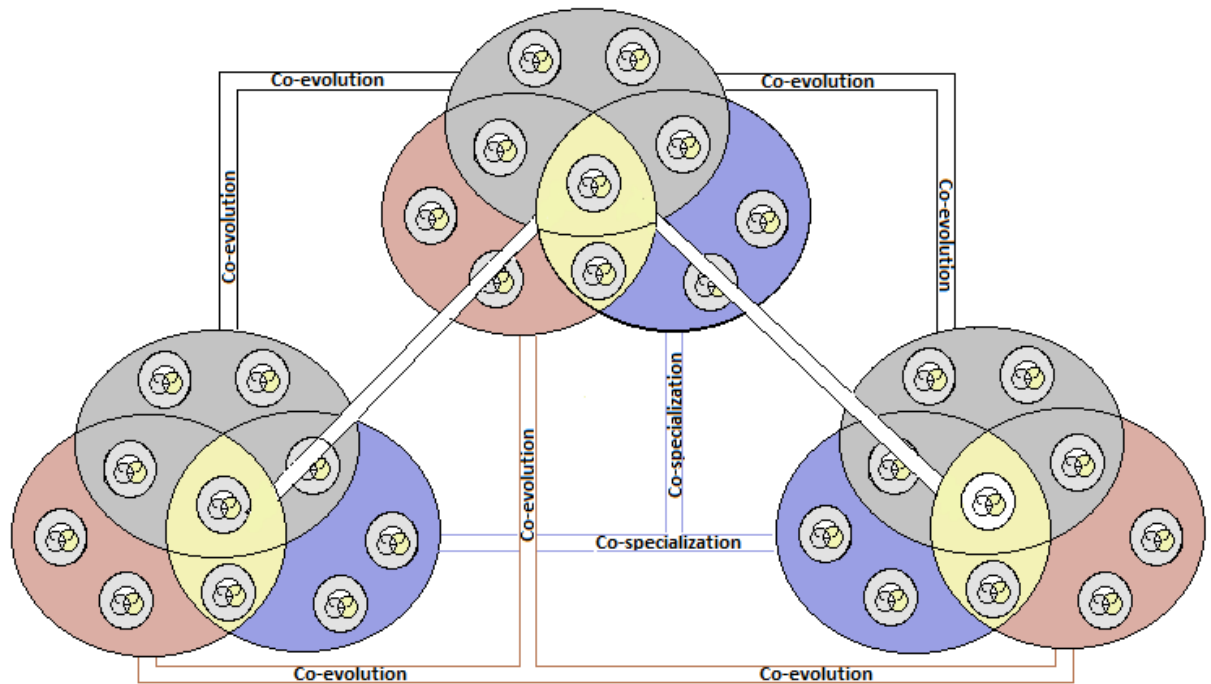


Source: Mode 3 non-linear innovation modes. Figure from Carayannis and Campbell (2012, p. 5)

Figure 5 presents a set of circles that overlap and are multi-laterally connected. The three circles in each set are government, university and industry. Figure 5 is aimed to show how knowledge and technology is proceeded by these traditional helices. For example, in market it is a wealth production by industry, at university it is novelty production, in the government it is legislation control. New knowledge and technologies circulate in the subsystems and create a spillover effect. As Dangelico et al. (2010) argue, knowledge-based economy contributes to political economy by endogenizing the social organization of knowledge and R&D into three (or more) dimensional systems (Sun and Leydesdorff 2009). Figure 5 is intended to demonstrate the complexity of the process of knowledge circulation, generation, and diffusion among various actors. Social networking capabilities mediate via the fourth Helix (society), they strengthen the likelihood of new knowledge and technologies emerging, and create

knowledge arbitrage events known as ‘**happy accidents**’ (Carayannis 2008, Carayannis and Clark 2011). According to Carayannis (2008), the ‘happy accidents’ serve as a catalyst of exploration that could empower programs and strategies for innovative development at any level.

Figure 5. Strategic knowledge, serendipity and arbitrage: multi-modal, multi-nodal, multi-lateral, multi-level 3C’s processes



Source: Own elaboration with inspiration of Carayannis et al. (1994, 2001, 2008)

The concept of knowledge production systems differs from the studies of national (Nelson 1993) and regional systems of innovation (Cook 1998, Braczyk et al. 1998). It is widely used by scholars of regional development and knowledge-based economy, because it can be empirically calculated. Works based on this concept were conducted in Brazil (Almeida 2005) and Sweden (Jacob 2006), a comparison analysis of Malaysia and Algeria was also conducted by Saad et al. (2008). Leydesdorff and Deakin (2011) conducted an analysis of interlinkage between localised region and global development of European agenda of “Smart specialisation” (Leydesdorff and Deakin 2011).

In accordance with the concept of Mode 3, the inclusion of different stakeholders, such as creator, user, and applier of technologies and knowledge, initiates substantial knowledge processing. Carayannis and Rakhmatullin (2014) argue that political and knowledge systems

are similar in the way that they both aim to improve the performance of society, because they both operate in an inclusive fashion. Hence, the innovation system can be a unifying point or platform for debates and creativity. The next section is dedicated to the Quintuple Helix and its fifth helix ‘environment’.

Model of sustainable innovative development

The Quintuple Helix model is based on the previous models, Triple Helix and Quadruple Helix, and contains an additional helix that represents ‘**environment**’ or ‘**natural environment**’. The aim of the Quintuple Helix is to incorporate ‘environment’ as one of the subsystems of the knowledge and innovation model, and raise awareness of the importance of environment in the society and the economy. According to Park (2013), environment along with democracy are integrated in a broader perspective of innovation systems. The purpose of the model is to outline the meaning of sustainable development and its implication in ‘**eco-innovation**’ and ‘**eco-entrepreneurship**’ under the current and future circumstances. Another important notion introduced in the model is ‘**circulation of knowledge**’ in the social subsystems, which is essentially synonymous with the source of knowledge (Barth 2012).

The Quintuple Helix model has been extensively studied by Carayannis, Barth, and Compbell (2012) in their famous article ‘The Quintuple Helix innovation model: global warming as a challenge and driver for innovation’ and ‘How do knowledge, innovation and the environment (natural environment) relate to each other?’ written by Carayannis and Campbell (2010) (see Figure 2). The authors visualised the collective interaction and exchange of knowledge at government level by mean of five subsystems (helices): education, economic, natural environment, media-based and cultural-based public (civil society), and political systems.

Knowledge-based innovation systems vary across countries (Kwon 2011). While the Triple Helix model has not been extensively applied beyond Western civilization (Khan and Park 2012), the main strength of the Quadruple and Quintuple Helix models is their universality and globality (Park 2014). The QH models are applied in the context of searching for the balance between democracy promotion, environmental sustainability and economic development in developing countries. In comparison to other research works, this dissertation thesis attempts to address the gaps within the existing literature by exploring peripheral areas and regions with low economic growth. The study is intended to be complimentary to the

abovementioned studies related to the enhancement of regional innovation systems. Therefore, the next chapter is dedicated to exploring selected theories on rural development.

Selected theories of rural development

There is much debate among academic researchers of rural studies relating to the theories and models of economic development in rural areas, and the role of the rural development policy and agricultural sector in boosting economic growth in rural regions (Cloke 1997, Lowe et al. 1993, Terluin 2003, Ray 2000). Despite agriculture remaining a significant policy sector in many countries, many rural areas rely less on farming in recent years due to urbanization processes, environmental changes etc. (Nage 1979, Biggs 1981, Dwyer 2007, Horna 2009). In the European context, the alternative economic activities are organic farming, maintenance of landscape, tourism, energy harvesting, etc.

Table 1. Agrarian versus rural development perception

Agrarian development	Rural development
Farmers' interests equal to the rural interests	Local actors pursue various activities according to their social affiliation and economic status
Multifunctionality of rural areas derived from traditional farming	Multifunctionality of rural areas is given by their internal diversity and externalities
Viable rural area is usually determined by farming activity, both culturally and economically	Competitive farming is not a condition for viable rural areas

Source: Own elaboration with inspiration of Ellis, 2001; Baldock et al. 2001

Table 1 presents two different perceptions of agrarian and rural development. According to Ward et al. (2002), rural development policy emerged as a counterpoint and intersection between other established fields, such as agricultural policy and spatial policy. However, one can observe some common features in terms of territorial and sectoral orientation of rural areas.

This perception of agrarian and rural development is reflected in the LEADER program aimed to promote diversification of economic activities and lifestyle through local competitive

advantages of a geographic area (Pausewang 1995). The political reorientation in many countries is also influenced by depopulation of rural areas (Terluin 2003, Ward et al. 2005). Meanwhile, Flynn and Lowe (1994) observe that these changes do not happen purely for economic reasons, because employability, structure of the local economy, social and political factors also majorly influence these changes. Cuddy (2005) argues that a key to the rural population's welfare is to create products with higher value to become more competitive and sustainable in markets. But developing countries fail to have higher added value in their final products due to thin markets and lack of information flow.

The exogenous model has been developed during post-war Europe, when industrialisation was in the middle of development. The main principles of the model were economies of concentration and scale, with primary function of providing food for growing and highly populated areas. Later the model was criticised for impeding development. It promoted the development of only a single settlement or segment of the market, but it neglected non-economic aspects of rural life (Ward et al. 2005). The endogenous approach is based on the idea that regions need to learn how to manage their local resources to achieve sustainable socioeconomic development. Table 2 presents a brief description of the main differences between endogenous and exogenous approaches.

Table 2. Endogenous and exogenous rural development

	Endogenous development	Exogenous development
Key Principle	Harnessing local resources for sustainable development	Economies of concentration and scale
Dynamic force	Local enterprises and initiatives	Urban growth poles
Main rural development issues	Modest capacity of areas and actors to participate in economic activities	Low performance of economic activities
Function of rural areas	Various and diverse service economies	Primary products for expanding urban economies
Focus of rural development	Capacity building	Modernisation of agriculture

	(infrastructure, skills and institutions)	
Criticism	Not practical in developed countries	Distractive and dependent development

Source: Own elaboration with inspiration of Ward et al., 2005; Buchenrieder et al., 2007

A new rural development model of “**neo-endogenous development**” was conceptualised by Ray (2000). This model is based on harnessing cultural potential and endogenous material to develop social capital in professional, business and organisation networks. One of the main preconditions for successful rural development in accordance with neo-endogenous development is good local government or local participation in democracy (Ward et al. 2005, Cabu 2001). Cabus (2001) proposes the concept of neo-endogenous development within the framework of the **global-local model**. He believed that social and cultural capital are the main driving forces of sustainable development. With regard to this, Ray (2003) suggested that local initiatives can develop ad hoc conceptual frameworks based on their accumulated experiences, but their perspectives will be realised only if they start to explore the interfaces located at the crossroad of bottom-up (endogenous) and top-down (exogenous) approaches. The next section is dedicated to the analysis of the role of government in promotion of sustainable development in rural areas.

The role of government in sustainable development promotion

Since the 1990s agricultural surpluses and growing environmental concerns have been challenging the identity of agricultural rural areas, and have prompted governments of developing countries and transition economies to look for ‘*a new model to support rural development*’ (EU Commission 1988, p. 56). The EU via structural funds chose a territorial approach and set a partnership between the sectors to target the ‘most needed’ rural regions (Ray 2000). Despite having some element of territorial policy, there was a strong presence of a top-down approach, tight parameters and disregard towards local interests (Ward and McNicholas 1998). The initiative set prospect was of ‘*local areas assuming greater control of development by reorienting development around local resources and by setting up structures to sustain the local development momentum after the initial “official” intervention*’ (Ray 2000, p. 8). The policy attracted much attention from scholars looking for a new role of

government sustainable regional development. Here I would like to refer to Mark Shucksmith and his article '*Disintegrated Rural Development? Neo-endogenous Rural Development, Planning and Place-Shaping in Diffused Power Contexts*'. Shucksmith analyses a new concept of rural governance and a new role of government to be '*coordinator, manager or enabler rather than provider and director*'. He suggests to govern with help of tangled hierarchies, flexible alliances and networks consisting of private and voluntary sectors, in other words to govern '*through community*' or '*at a distance*'. Shucksmith (2009) re-conceptualised the power concept of relations in rural society to become a matter of social production ('*power to*') rather than social control ('*power over*').

Healy (2004) proposes a different opinion about the role of government. He suggested that the main functions of the government should be to exercise generative power to stimulate action, innovation, struggle, and resistance, rather than to direct government investment with authoritative power. In his concept, the government has two main issues to address (1) how to mobilise actors to develop strategic agendas in diffused power contexts, and (2) how to employ concepts of place and space in the process of place-shaping.

Less developed countries face difficulties to conduct extensive decentralised and territorially based policy due to insufficient capacity and vertical relations of governance. Healey et al. (2003) suggest a useful analytical framework of neo-endogenous rural development and local mobilisation. Healey's empirical studies revealed that institutional capacity-building of local governance is determined by **knowledge resources** (intellectual capital, local and expert knowledge), **relational resources** (trust and social understanding built up through interaction), and **mobilisation capabilities** (the capacity to act collectively). Within her concept, she investigated '*how knowledge resources and relational resources are mobilized; how this affects the frames of reference or discourses through which meanings are disseminated; and the relation between such discourses and the practices through which material actions are accomplished*' (Healey et al. 2003, p. 62). The concept is particularly useful to evaluate the institutional capacity that was dedicated and developed within the initiative and the extent to which structural policy agendas were reinforced and transferred.

Growth Models in Less Developed Countries

During the 1960s and 70s, the issue of stagnation of poor countries in terms of productivity, living standards and increasing gap between economically less developed and industrialised

countries was widely discussed (Mach 2001). Solow's theoretical concept of long-term economic growth fell to explain the realities. *Romer's 1986 paper in the Journal of Political Economy* brought radical changes in the conclusions that were derived from the models of Solow and Ramsey. He broadened the definition of capital to include **human capital** and/or **knowledge capital**, and it was no longer obvious that there were decreasing returns. His discovery made him a pioneer of "*endogenous growth theory*". The existing gap (difference) in the average level of labour productivity and level of living standards between developed and developing countries is permanent in nature (Mach 2001). These countries either do not converge, or the process of convergence is slow due to the initial advantage of the developed countries in terms of human and physical capital per capita (Romer 1986, Kremer 1993, Uzawa 1965).

According to the theory of endogenous economic growth, the technological process is an endogenous factor that happens during market activities of various entities and their interaction with the market environment. The technological process happens through innovation in a form of introduction of new products, services or technologies to the market. The fundamental problem of endogenous growth is how to stimulate technological progress (Lucas 1988, Mulligan and Sala-i-Martin 1993).

Stern (1991) argued that the endogenous growth theory contributed to understanding of the determinants of long term economic growth in developed countries, but it did not succeed to determine its critical factors, such as the role of *management and organization, insufficient infrastructure, and sector transfer* in developing countries (Zarra-Nezhad and Hosainpour 2011).

Pio (1994) attempted to apply the endogenous growth theory to developing countries. He found that the dynamic optimisation framework of the endogenous growth model did not capture all relevant issues that developing countries deal with. These included objective functions of government, political and economic allegiances, the state of human capital development, population growth, income distribution and the population age structure.

The study of Acemoglu and Zilibotti (2001) revealed that most technologies used in developing countries were created in developed countries and were designed to make optimal use of the skills of the labour force in developed countries. But, as the labour force is less skilled in developing countries, productivity remains low.

Petrakos and Arvanitidis (2008) studied the determinants of growth in developed and developing countries. They conducted questionnaires among experts, policy makers, academics, and business people. They found that factors such as knowledge, technology, innovation and human capital have great importance in developed countries, whereas the most important determinant factors in developing countries are related to the socio-political framework.

Much of the recent debate over economic growth has centered around the issue of convergence (Barro and Sala-i-Martin 1995, Sala-i-Martin 1996). The authors distinguish several types of convergence, among the most discussed is conditional **β -convergence**. It is based on the idea that the steady state of the country depends on technological superiority and its behavioral characteristics. Conditional β -convergence occurs when a growth rate (regional) economy positively correlates with the distance that separates it from its own steady state. Conditional β -convergence was discredited when β -convergence with a decrease in income dispersion was observed. The authors of the concept justified it by the greater similarity of social, institutional, structural and technological parameters within a country rather than at international level. Hence, the tendency toward convergence is more prominent on the interregional rather than international level. However, it remains questionable whether the main cause of conditional β -convergence between regions is fiscal integration across the country.

Therefore, scholars of endogenous growth theory came up with suggestions for accelerated economic growth¹:

- To create tax incentives for expenditure on research and development of new technologies
- To encourage investment in human capital
- To increase infrastructure spending, such as investment in the construction of schools, roads and airports, and also to increase the rate of return on private investment by bringing benefits to consumers

¹Dowrick and Nguyen, 1989; Barro, 1991; De Long and Summers, 1991, 1992a, 1992b and 1993; Murphy, Shleifer and Vishny, 1991; Fischer, 1991 and 1993; Mankiw, Romer, and Weil.1992; Levine and Renelt, 1992 and King and Levine 1993a and 1993b

- To reduce the budget deficit, which crowds out private investment

Barro (1991) and Barro and Sala-i-Martin (1992) recognise the economic importance of social and physical infrastructure. The governments in developing countries are most of the time responsible for investments in infrastructure. However, due to budget constraints, infrastructure in developing countries remains undeveloped. Barros (2001) conducted an interesting analysis of consequences of investments in social and physical infrastructure on economic growth. They suggest that marginal productivity of these investments in any country is an empirical question and it is difficult to estimate. Therefore, the government must estimate for their own country and decide what the domestic priorities should be.

Despite substantial progress in the literature covering a variety of issues related to long term economic growth, a considerable gap remains between the actual needs of policy practitioners and academic interests. Economic growth theories do not often take aspects such as cultural variables into consideration. For example, Leikres (2009) studied how the norms and goals of a society affect economic growth. His results show that attitudes towards and trust of official and non-official institutions in a society play an important role in economic growth. Unlike developed countries, developing countries are mainly interested in short to medium-term growth and accelerating knowledge and technological progress by importing foreign innovations. In general, scientists are inclined to believe that the growth theories have not succeeded to assess the determinants of growth in developing countries. Furthermore, definitions and measurements of theoretically predictable determinants are very different and more complex in developing countries in contrast to developed ones. The current long-term economic growth theories, do not take into consideration variables such as culture or informal institutions, which offer a set of values that are significant for economic development.

1.3 Selected theoretical concepts of ‘learning region’

Jessop (1998) argues that models and practices of governance must be simplified to achieve efficiency. He proposes a mechanism of governance that requires establishing a common concept of development of the capacity for dynamic interactive learning, and a system of meta-governance to coordinate activities across the time and space domains. According to Dosi (1982), learning capacity can come from various sources, such as the public sector, international NGOs, and social network connections through sharing of experiences. Mark

Whitehead (2002) defines '**meta-governance**' as a counter-process through which political and economic coordination is achieved against the network failure possibilities. He argues that governance and meta-governance sometimes fail in situations when political goals (the composition of deciding actors) are removed from changing concerns of the population or in the presence of irreconcilable conflict and deadlock.

There are three interrelated strategies to avoid such meta-governance failures:

- Deliberate cultivation of a flexible repertoire of responses.
- Self-conscious monitoring and reflexivity about governance, its objects, and its outcomes
- Self-reflexive 'irony', whereby participants in governance recognise the risks of failure but proceed as if success were possible (Jessop 2005, p. 4)

Sorensen and Torfing (2009) note that meta-governors should offer a more hands-on approach in the context of network management and participation, but at the same time should be willing to step back from network design and combine hands-on and hands-off methods. They also highlight storytelling as an important governance tool to define the joint mission of the network, as through popularisation of 'best practices' they can align the goals of network actors and convince them of the urgent need for coordination and joint action. Despite variations of meta-governance today, it is still questionable whether their observations can be formed into the remedy.

A new paradigm of the learning region has been developing from different angles in regional studies and takes its origin from studies of innovation systems (Camagni 1991), clusters (Benner 2003), technology policies (Maskell and Malmberg 1999), environment (Maillat 1991) etc. The development of the concept of the learning region received wide attention because it enables scholars to observe the quality of policy making and institutional conditions in regional economies. For instance, OECD et al. (2001) developed their regional development concept and suggested to improve individual and collective learning processes of regional actors through flexible and open networks.

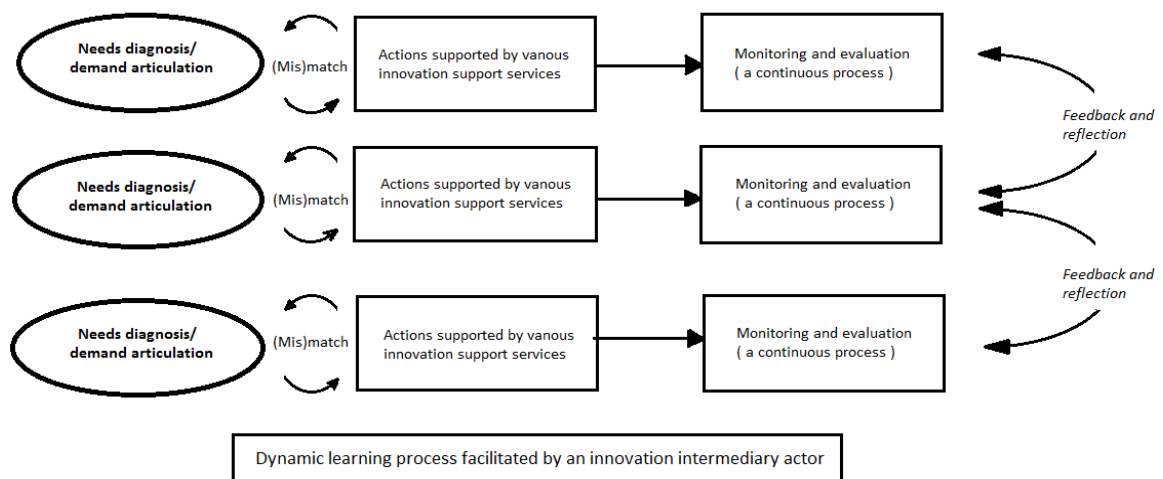
Scholars suggest to develop current and normative frameworks of regional learning into an empirical research tool to analyse and evaluate to what extent existing (policy) arrangements can support regional learning and innovation processes in rural areas, and to identify possible

institutional voids. Wellbrock, Roep and Wiskerke (2012) identified two different ways to support regional learning and innovation. The first is to support collaboration between academia and industry through the commercialisation of knowledge. The advantage of this approach is to increase competitive advantages of businesses on a regional scale. The second is human capital development, which improves the usage of scientific knowledge and competitive advantage internationally. Wolfe & Gertler (2003) argue that a key to successful regional learning and innovation is to provide facilities to regional business to develop their skills and capacities to filter and use new scientific knowledge to their competitive advantage, rather than to support knowledge spillover and valorisation. Both approaches have similarities in the aim to create competitive regions based on re-appreciation of place-based resources and assets, rather than compensating disadvantaged regions.

Recently the research of regional learning and innovation has shifted its focus from forms of knowledge to knowledge processes. This shift is driven by the rise of attention on cooperation and partnership in rural areas to pass knowledge to new generations and increase visibility of their business activities. Knowledge exchange happens through an interactive social and situational process, known as '**joint learning-by-doing**', rather than a formal learning setting with a message sender and a receiver. Hence, the focus of the framework presented in Figure 5 is the interfaces that facilitate knowledge processes, collaborative social learning, and re-embedding of local knowledge in grassroots development initiatives, in contrast to the transfer of new, scientific, and expert knowledge. This concept became widely implemented in place-based research, where the process of interaction with local supporters and beneficiaries leads to identification of interfaces, their arrangements and a general heuristic framework to evaluate existing arrangements and identify inconsistencies between the existing institutional order and actual practices of policy making (Hajer 2003). Regeer (2009) and Mierlo (2010a) suggest analysing opportunities and weaknesses of a regional innovation system (Regeer 2009, Mierlo 2010a) to identify in-demand resources and knowledge (Smits 2002, Sumberg and Reece 2004, Klerkx and Leeuwi 2008b). Parkinson (2009) notes that demand is a static process in innovation processes, despite the fact that it looks like a diagnostic at the very beginning (Parkinson 2009). While, Regeer (2009) argues that innovation is a constant process of planning, acting, reflecting and reorganization that entails a continued learning agenda and adjustment to opportunities and problems that appear over time.

Figure 6 presents a framework of a dynamic learning agenda. The framework discloses the process of adaption of new goals and plans (van Mierlo, et al. 2010a), which entails continuous monitoring and reevaluation of undertaken activities. The activities are supported by various innovation support services or intermediaries that receive feedback and reflections from all parties, identify emerging demand, and (mis)matches between the provider and receiver of innovative support services.

Figure 6. A framework of a dynamic learning agenda



Source: Own elaboration with inspiration of Regeer, 2009; Klerkx and Leeuwis, 2009

The unique context and complexity of agricultural innovation system needed to be considered to apply the framework to the context of developing countries. The assessment of agricultural innovation systems has two main dimensions: ex-ante and ex-post. Ex-ante assessment analyses the possible impact of potential innovative trend, while ex-post evaluation assesses the impact after implementing the innovative intervention. Both approaches seek to improve the previous experiences through the provision of accountable and transparent processes of adopting innovation.

The literature (Pant and Hambly–Odame 2006, World Bank 2012) suggests three analytical methods to assess trends in agricultural innovation:

- theory of change
- case-studies approach
- benchmarking

Pant and Hambly–Odame (2006) argue that the **theory of changes** is an assessment of underlying assumptions and values of the stakeholder network in the innovation process. It is often referred to as the causal model, which is used to identify the potential outcomes of innovative projects. It gathers various stakeholders with different profiles to identify complementary and conflicting areas of innovation. Hence, the theory itself is developed at the beginning of the assessment and changes as a project goes through its implementation stages, the theory can be revised.

The **case-study approach** is often used to analyse selected functions of a new innovative approach in a country, industry or sector (Wenninck and Heemskerk 2006) through identification of the following structural components of an innovation system (Lundvall et al. 2009, Klerkx et al. 2013 and 2011):

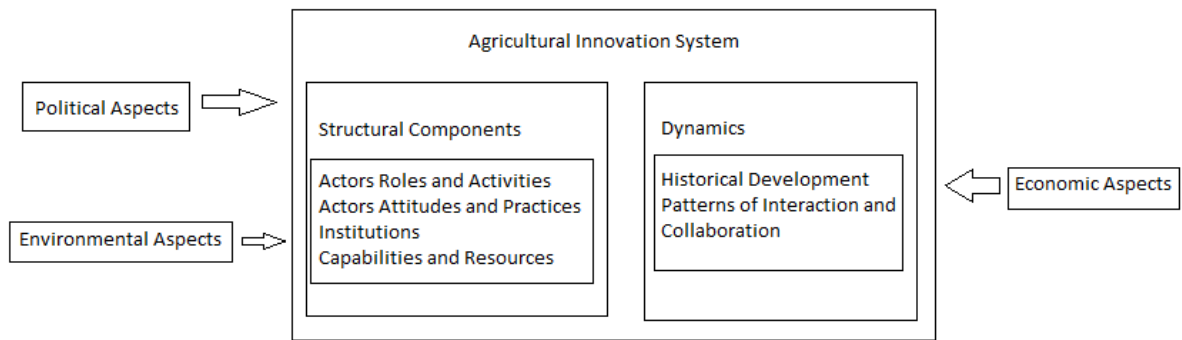
- Institutions
- Interaction and collaboration
- Capabilities and resources

According to Swaans (2014) an innovation system is “*a broad network of dynamic linked actors within an institutional context*” (Swaans et al., 2014, p. 2). Therefore, to determine the innovation system Hall et al. (2006) recommend to identify (Hall et al., 2006, p. 28):

- Actors, their role, and activities
- Attitudes and practices of main stakeholders
- Pattern of interaction
- Enabling environment (policy and infrastructure)

The conceptual framework of the innovation system adjusted for the research of this dissertation thesis is developed based on notion and determinants of Swaans et al. (2014), Hall et al. (2006), Ranga and Etzkowiz (2013), Lundvall et al. (2009) and Klerkx, (2015). Figure 7 presents an integrated framework of their structural components. The framework aims to identify the components that enhance or hamper innovation system development.

Figure 7. Conceptual framework of the innovation system



Source: Own elaboration- Ranga and Etzkowiz, 2013; Lundvall et al., 2009; Klerkx, et al., 2015; Swaans et al., 2014, p. 2, Hall et al., 2006, p. 28

Benchmarking aims to identify mismatches and gaps within the innovative system, particularly between institutions and state policies. It compares input indicators, which take the form of investments in the functions of the innovation system, with output indicators, and output indicators are certain products or trends. Bloch (2007) suggests that at policy program level, innovation benchmarks and indicators are used to identify trends within a country, or to compare innovative capacity of various actors within a national innovative system to assess how well they absorb capacity and competitiveness. Table 3 below summarises the most common best practices for benchmark data collection for measurement of the innovation system and techniques (OECD 1997, 2005).

Table 3. Indicators for Innovation Systems and Benchmarks

Measurements	Interaction among enterprises, e.g. joint research activities
	Interaction among enterprises, universities and public institutions, e.g. joint publication
	Diffusion of knowledge, information, technology to enterprises, e.g. skills training
	Human resource flow, e.g. movement of skill human force between public and private sector
Technique	Institutional assessments to analyse industrial clusters, institutional linkages

	Innovation survey among enterprises on their source of knowledge to innovate
	Cluster analysis aims to assess the cooperation between network of entrepreneurs among themselves, the sector and internationally.

Source: Own elaboration with inspiration of OECD 1997 and 2005

The current trends of innovative approaches in developing countries are discussed in the next section.

1.4 Current trends in developing countries

The Food and Agricultural Organization of the United Nations (FAO) prognoses the increase of agricultural output by 60 percent in 2050 compared to the annual average for the period between 2005 and 2007, which is roughly by one percent per year. However, the acreage cultivated globally is not projected to increase substantially. The increase in agricultural production is planned to be achieved mainly by a yield increase of 10 to 14 percent. Scientists expect the back-to-the-roots trends to persist in developed countries and result in additional restrictions and regulations. Nonetheless, it might drive the demand for innovations that increase the efficiency of organic farming and reduce its costs.

‘Precision farming’ is a method that uses data of the square meter or even of a single plant to optimise consumption of inputs and make changes to accommodate variable features in the field. It has not become widespread in practical usage yet due to lack of availability of software, sensors and wireless connectivity in farming inventories.

Literature distinguishes socio-economic, agronomic and mechanical technological constraints to adopt new technologies to agriculture (Marchenko and Leachman 2014).

Socio-economic constraints. The introduction of precision farming increases costs through the purchase of additional processing equipment and services, and costs to obtain information are high. Hence most producers in developing countries do not have sufficient financial resources, skills and time for its adoption.

Agronomic reasons are mainly related to weak development of agronomic science, advisory services to help farmers to differentiate usage of fertilisers, soil maps of required scale, and improve their *mechanical and technological base*.

Mytelka and Oyelaran-Oyeyinka (2006) argue that food-security issues in developing countries need to be addressed by means of new and innovative approaches. However, several factors impede the implementation of these new approaches:

- Lack of sufficient financial sources to conduct radical land reforms
- High inflation in the world economy leads to a decrease in income from raw materials and agricultural products in developing countries, and an increase in income of developed countries that produce manufactured products

- Lack of water resources and concurrent rapid population growth,
- Increase in demand of production and slow integrational processes among regions and countries,
- Low food storage capacity in developing countries which makes their population very vulnerable to climate change.

Yet, there is a hope that ‘precision farming’ one day will be a part of daily agricultural practices, because various restrictions implemented in environmental legislation, the growing importance of the production chain and food processing, and public concern over the quality of food production will all create pressure on governments for its adoption.

Another trend in innovative agricultural development of developing countries is an increasing usage of small and medium-size production applying some methods of the “**Green Revolution**”. Originally, the “Green Revolution” took place in the 1960s and 70s in Mexico, India, Iran, Pakistan and other countries. It was a time when governments tried to decrease disturbance of the poorest layers of population through the increase of food production by means of new high-yielding crop varieties, large doses of mineral fertilisers etc. Tabor, Janssen, and Bruneau (1998) argue that the “Green Revolution” stopped not only because the outrage decreased, but also due to salinisation of large doses of mineral fertilisers and lack of financial sources etc. (Tabor, Janssen, and Bruneau 1998).

For centuries agrarian reforms in developing countries took place under the process of land redistribution in favour of certain layers of the population and to the detriment of others, in a fight for power in a territory, or in religious feuds between various faiths and nationalities. Today, governments of developing countries became more innovative in their approaches by giving much more credit to the issues related to national food security and other political and economic circumstances. Spielman and Birner (2008) argue that the objective necessity requires governments to target economic goals while conducting agrarian reforms. There are many case studies illustrating how to eliminate hunger in the short term and improve the efficiency of land use (Wennink and Heemskerk 2006), increase income of the poorest segments of the population (Potter 2008), intensify the development of food industry (Alston, Norton and Pardey 1994), achieve food security (Akramov 2009) etc.

Literature suggests that the increasingly important role of retail chains and food trade is an important innovative trend in agriculture in developing countries (Rutten 2001, Acosta and Douthwaite 2005). In comparison to developed countries, developing countries hardly possess any industries that would produce agricultural machines or R&D to progress the agricultural industry. Most of the new innovative technologies and agricultural machineries are imported from developed countries. The branches of the foreign firms service their new equipment and technologies to the population of developing countries. Foreign retailers that operate in developing countries sell foods, and actively involved in their production, storage, packaging, transportation and sales. Lundvall, Joseph, Chaminade and Vang (2006) argue that it is correct to say that developing countries have an **agro-trading complex** rather than an agro-industrial complex.

The roles of **co-operatives** in agricultural development is an important topic in academic literature. Co-operatives provide support to help peasantry realise the production surplus, increase revenue from its production, provide protection from big and state local firms, and international monopolies etc. Usually governments of developing countries monitor and control the situation so that monopolies and governmental officials do not violate rights of cooperatives. Case-studies on agricultural cooperatives can be observed in Mexico (Richardson 2009), India (Devi and Govt 2012), Tanzania (Salaam 1982) etc.

Douthwaite and Ashby (2005) note the **strengthening role of government** in reformation of agriculture in developing countries. Academic literature highlights the main role that are undertaken by governmental bodies:

- Support and maintain soil fertility
- Promote the development of the “Green Revolution” and other reforms to intensify agricultural production
- Promote the development of various forms of cooperative farming
- Provide support to develop national resources and stocks of food (Ravallion and Chen 2004, Kasirye 2010)

Venkatasubramanian and Mahalakshmi (2012) highlight that it is critical to adjust institutional mechanisms of innovative agriculture to unique features of individual countries. These unique features are usually associated with undeveloped productive forces, presence of remnants of

patriarchal and tribal relations, dependence on the former colonial powers, and complex relations between different regions and ethnic groups that impose additional constraints on industrial development. On the other hand, Fischer and Hartmann (2010) argue that these national features of developing nations contribute to more intensive development of industrial relations, which boost the economic and social progress through the appearance of contradictions in society leading to its development.

Ewing and Msang (2009) identify the following factors influencing development of innovative agriculture in developing countries:

- Climatic conditions
- Presence of **fresh water** for crop irrigation
- Presence of **collectivism** in most developing countries. Unlike in Western civilisation, private property and small and medium-size entrepreneurs play an important role in social cohesion in most developing countries.

The innovation system approach is a widely-implemented framework for both developed and developing countries in order to provide a series of guidelines to strengthen inter-organisational linkages, capacity building in the public supporting and business sectors, engineering, development etc. The history of many developed countries shows that development of innovative functions and placing them into operation as a coherent system can bring national economic and social progress.

1.5 Semi-conclusion

The main objective of this chapter was to analyse the functions of the regional innovation system, specify desirable mechanisms and factors for promoting competitiveness and innovation, and assess the policy implications.

The chapter discussed selected major theoretical-methodological approaches in conceptual application for regional innovation systems with **a focus on developing countries**. I would like to hereby mention again the very first scholars who influenced the first waves of discussion on the subject. Economic development of countries around the globe did not confirm the theoretical concept of Solow's model. Romer's 1986 paper in the Journal of Political Economy broadened the definition of capital by including human capital and/or

knowledge capital, and it was no longer obvious that there were decreasing returns. Lucas (1988, 2006) and Romer (1989) were the first to point out to the spillovers resulting from R&D expenditures, which turned into a great discussion on a new paradigm of learning region. The paradigm originated in subjects such as innovation systems (Camagni, 1991), clusters (Benner, 2003), technology policies (Maskell and Malmberg, 1999), and environment (Maillat, 1991).

According to the neo-institutional perspective, the full functioning of the regional innovation system is possible under the conditions of the **‘balanced’ model**, which is associated with **‘Knowledge Societies’**. Cooperation among all actors of the Triple Helix model – university, industry and government generates infrastructure of knowledge, and when their functions interface, **hybrid organisations** are established (Carayannis and Campbell 2009). Interaction within the TH’s interfaces leads to transformation of the initial position of actors. The relations of the TH’s actors are continuously reshaped in **‘an endless transition’** and induced by new technologies, ICT etc. (Etzkowitz and Leydesdorff 2000). The neo-evolutionary perspective suggests that the TH’s actors are co-evolving subsets of social systems (Ahrweiler et al. 2011, Windrum 1999). The forms of interactions between them consist of two processes: communication and differentiation (Ivanova and Leydesdorff 2013, and 2014, Pyka and Scharnhorst 2009). Etzkowitz et al. (2004) argue that internal **differentiation** within an institutional sphere is a catalyst for generation of new types of structures and links that connect different spheres, while institutional spheres have functions of selective mechanisms generating an innovative environment and ensuring the ‘regeneration’ of the system (Leydesdorff and Etzkowitz 2000).

Desirable mechanisms and factors for promoting competitiveness, innovation and assessment of the policy implications

The Society Helix in the **Quadruple Helix** strengthens the likelihood of new knowledge and technologies, and creates knowledge arbitrage events known as **‘happy accidents’** (Carayannis 2008a/ b/ 2015, Carayannis and Clark 2011). ‘Happy accidents’ happen during collective interaction and exchange of knowledge by means of various sub-systems such as the educational system, economic system, media-based and cultural-based public, and the political system (Carayannis, Barth and Campbell 2012). The **Quintuple Helix** model provides a broader perspective of the innovation system by adding ‘Environment’ as one of

the subsystems. The TH model has not been extensively applied beyond Western civilization (Khan and Park 2012), while one of the main features of the Quadruple and Quintuple Helix models is their *universality and globality* (Park 2014). The models capture top-down policies and practices, bottom-up and mid-level out civil society grassroots activities, and initiatives that make cooperation among the traditional helices more comprehensive.

In relation to rural or peripheral areas and regions with low economic growth, Ray (2000) suggests creating competitive regions based on re-appreciation of *place-based resources and assets*, rather than compensating disadvantaged regions. Shucksmith (2009) re-conceptualised the power concept of relations in rural society to become a matter of social production ('*power to*') rather than a social control ('*power over*'). He (2009) suggests governing '*through community*' or '*at a distance*'.

Recently there has been debate on fiscal integration between economic developed and less-developed countries, and whether it stimulates economic convergence. Conditional **β -convergence** is based on the idea that *the steady state* of a country depends on technological superiority and its behavioral characteristics (Barro and Sala-i-Martin 1995, Sala-i-Martin 1996). When conditional β -convergence was discredited, the authors of the concept justified that the tendency towards convergence is more prominent on the interregional rather than international level. Barro (1991) and Barro and Sala-i-Martin (1992) recognise economic importance of social and physical infrastructure. However, infrastructure in developing countries remains undeveloped due to budget constraints. Barros (2001) suggest that marginal productivity of investments in a country is an empirical question and it is difficult to estimate, hence the government must estimate it themselves and decide what the domestic priorities should be. Unlike developed countries, **developing countries are mainly interested in short to medium term growth** and accelerating knowledge and technological progress by importing foreign innovations. Governance sometimes fails in situations when political goals (composition of deciding actors) are removed from the changing concerns of the population, or in the presence of irreconcilable conflict and deadlock. Jessop (1998) proposed a mechanism of governance that requires establishing a common concept on development of the capacity for dynamic interactive learning and a system of **meta-governance** to coordinate activities across the time and space domains.

Today, new institutional mechanisms take into consideration the specifics of developing countries to introduce innovation. Interestingly some scholars (Fischer and Hartmann, 2010; Ewing and Msang, 2009) believe that these specific features of developing countries contribute to more intensive development of industrial relations, which boost economic and social progress through appearance of contradictions in the society leading to their development.

The innovation system approach is a widely-implemented tool in both developed and developing countries to provide a series of guidelines. It became an analytical and prescriptive tool for policymaking in developing countries to determine context-specific factors preventing from the creation of innovation systems and failures within the systems, and simultaneously support the formation of policies that respond to the needs of developing countries at various stages of their development.

2 Methods for organisational assessment

This chapter introduces selected methodologies to assess current constraints and opportunities of the regional innovation system in the agricultural sector of Kazakhstan. For this purpose, the following tasks were set:

- to identify and evaluate functions of individual organisations (Agricultural Ministry of the Republic of Kazakhstan, its subsidiary agencies and SMEs)
- to assess the coordination between them
- to determine the optimal environment for them to innovate.

Background information

This research is an explanatory study of the agricultural innovation system in Aktobe, Kazakhstan. Kazakhstan was selected from the post-Soviet republics as a good example to investigate how the unbalanced level in regional development and weak relationships at national, regional and local levels influence the viability of the capacity of SMEs within the regional innovative system. It is the 9th largest country with a territory of 2.7 million sq. km. The population of the country is 18 million, of whom 45% live in rural areas. The climate of Kazakhstan is extreme continental and dry; this is due to its remoteness from all oceans. Kazakhstan is located in six climatic zones: forest-steppe; steppe; semi-desert; desert, foothills and mountain area. The vegetative period lasts for a relatively short time, from 105 to 165 days, and is longer in the southern regions. Water resources are limited. Both climate factors have a major impact on agricultural lands and pastures in Kazakhstan.

The existing Kazakh agricultural strategies are adjusted to the climate differences across the regions. Climate conditions in the north and south-east of Kazakhstan favour wheat production, while the rest of the regions are specialised in livestock production. The government has introduced local coping strategies and practices to cope with climate-related risks in agricultural production. However, further steps should be taken to introduce good coping practices and further the understanding of the innovative capacity of SMEs under the existing conditions throughout Kazakhstan. This requires implementation of an efficient institutional mechanism.

Aktobe is located in the north-western part of the country on the border with Russia. It has a well-developed infrastructure in comparison to other regions of Kazakhstan, and its strategic geographical position provides an advantage for better access to the Russian market, as well as Arab and Middle Eastern countries, to export meat production. Despite this, the region contributes only 6% to total national meat production. At the same time, there is a growing dependence on imports of meat and meat products throughout the regions, which indicates low concentration of production in the regional centres and low quality of meat produced.

2.1 The assessment framework and objectives

The case study approach was selected to get an overview of the main opportunities and challenges for development of innovations and to get new insights into the latest developments and trends (Robson, 2002). This exploratory research is founded on multiple sources of information entailing stakeholder observations, government documents, expert interviews and stakeholder group interviews.

The operational interfaces were mapped in the sector of meat production and data were collected for the following research questions:

- Who are the major players in the value chain (e.g. meat processing companies)?
- Who are the main stakeholders and what are their functions within the regional innovation system of Aktobe?
- Are there any organisations that provide extension services in the region and what is the quality of their services?

Edquist (1997) argues that assessment of the decision process, both ex-ante and ex-post, requires identification of key functions of agro-industrial systems. However, to examine a sector or technological domain requires understanding of socioeconomic, cultural and geographic contexts that tend to shape organisations, institutions and interactions among stakeholders within an innovation system. Therefore, the case study method is an appropriate methodological approach to capture important aspects, while meta-analysis of case studies enable researchers to conduct comparison analysis across commodities, institutions, regions and countries (World Bank, 2006; Wenninck and Heemskerk, 2006; Larsen, Kim, and Theus, 2009).

The case study approach is a qualitative method that entails an empirical investigation of a “contemporary phenomenon within its real-life context using multiple sources of evidence”(Robson, 2002, p. 178). It was selected to get an in-depth contemporary on the case-specific, real-life context (Yin, 2013). The subject of the analysis is two case studies of the agricultural innovation system in Aktobe, its selected structural components and stakeholders. Aktobe region was selected for the research as an illustrative example that has great potential for agricultural production, especially meat production. The agricultural sector in the region is dominated by small and medium-sized farmers that have limited technology capacity and limited resources for R&D.

These firms have a specific knowledge need that is largely unknown to education institutions and government agencies, despite many recent or ongoing small firm-oriented initiatives, often inappropriately tailored to SMEs’ demands.

2.2 Operationalisation

The conceptual framework of the innovation system presented in the current section is drawn from theoretical literature and defined based on measurable indicators. The findings of the section of selected theoretical aspects of regional learning presented in the previous chapter are utilised in Table 4 in the form of a template for operationalisation. Similarly, figure 7 illustrated in the previous section presents a conceptual framework based on the structural components of the agricultural innovation system, where indicators give operational definitions for the components, and the instruments show the way the data were collected.

The conceptual framework presented in Table 4 provides the underlying structures for a semi-structured guideline for the interviews. The questionnaires are attached in Appendix A and B. The interviewees were asked about availability, features and general feedback of the structural components. External factors, such as economic, environmental and political factors of Kazakhstan and post-Soviet regions are covered by numerous academic publications, but on-site observations and interviews were also conducted in certain cases to clarify the facts.

Table 4. Operationalisation of Structural Components and their interactions within the agricultural innovative system

Structural Components	Indicators	Instruments
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Stakeholders and their role	A diverse set of organizations from the private to public sector engaged in the agriculture sector	Interviews with stakeholder On-site observation
Stakeholders, their attitudes and practices	Attitudes restricting cooperation and collaboration between stakeholders; Emphasis on institutional learning (using and accessing knowledge more effectively) and technological learning; Top-down culture; Transparency; Trust and reciprocity; Ineffective and/or conservative attitude;	Interviews with stakeholder On-site observation
Capabilities and Resources	Financial sources; Quality and quantity of human resources; Labour qualification;	Interviews with stakeholder
Patterns of collaboration and interaction	The presence of effective sector-coordinating bodies; Pro-active networking; Integration of mechanisms to promote activities and agendas of the innovative system; Understanding and awareness among stakeholders	Interviews with stakeholder On-site observation Documents
Institutions	Agricultural subsidies, market access, formal and	Interviews with stakeholder On-site observation

	informal institutes	Local newspapers
		Documents

Source: Own elaboration, based on Schut, Rodenburg et al. 2015

2.3 Methodology: case study 1

The survey was conducted in five districts of Aktobe region during the summer of 2016 (over 3 months), since I have more than three years' research experience in the rural districts of the region. By request of the governor of Aktobe region, 5 major projects in 12 administrative districts of Aktobe have been conducted since October 2012. Therefore, the developments and changes during the past years are analysed and the financial and value chain constraints of Kazakh beef sectors on the farm-level and credibility of official policy responses are scrutinised.

The region has national importance in livestock production development. The most successful and promising villages in Aktobe region in terms of agriculture and livestock production were selected based on the annual report of the Municipality of Aktobe region. There are Sazdinskyj sel'skyj okrug, Kargalinskyj sel'skyj okrug, Kuraylinskyj sel'skyj okrug, Novyj sel'skyj okrug, Blagodarnyj sel'skyj okrug, Blagodarnyj sel'skyj okrug (Nokin's village).

With the help of a questionnaire with 15 questions, the main representatives of 69 agricultural enterprises were asked for their opinion on several issues related to financial and value chain constraints. The survey was conducted as a standardised face-to-face interview version during the assessment phase of the socio-economic profile of selected administrative districts with a great economic potential in collaboration with Aktobe Regional State University named after K.Zhubanov and the Municipality of Aktobe region.

The approach of OECD (2013) was implemented to distinguish four types of agricultural enterprises:

- Agro holdings are agricultural enterprises that belong to vertically and/or horizontally integrated business groups, typically developed by domestic investors
- Agricultural enterprises that are mostly large-scale farms, which were formerly part of a state or collective farm

- Small to medium-sized farms with private ownership and which mostly hire outside labour
- Household producers, typically small to micro-scale plots used by families for subsistence-oriented farming

Table 5 provides an overview of sample structure and selected key measures of operational scale in the different subsamples, taken from databases of Aktobe Regional State University named after K.Zhubanov and the Municipality of Aktobe region. It shows great variation in utilised area and herd sizes across farm types. Household producers have a very small plot of land and keep one or two cows. Most individual farms had a median utilised area of 75 hectares (ha) in 2015, and on average keep 30 animals or 10 cows. The large enterprises utilise a median of 12,750 ha of land for ordinary enterprises or double the size for agro holding.

Table 5. Operational scale of different farm types in the survey data

	Householder s	Individual farms	Agricultural enterprises	Branches of agro holdings
Number of farms, survey sample	34	24	7	5
Utilised agricultural area (ha)	0.02 (0.01;0,05)	73 (19;138)	11,200 (3,856;16,643)	22,000 (8,567-28,600)
Farms with cattle (%)	19	16	6	3
Among which: size of cattle herd	2 (1-4)	35 (0-73)	280 (73-390)	-

Source: Databases of Aktobe Regional State University named after K.Zhubanov and Municipality of Aktobe region

Methodology for data analysis

Based on the survey, the analysis of producers' access to (public) funding is conducted, applying the method of directly detecting the individual borrowing status from the

respondents. For this purpose, the conceptual framework of Boucher et al. (2009) was used, which distinguishes **categories of credit rationing outcomes**: price rationing, quantity rationing, risk rationing and transaction cost rationing. The individual rationing outcomes were detected by a cascade of interview questions following Boucher et al. (2009) (see Figure 8).

Non-borrowers had multiple answers to the question of why they did not borrow the money from the financial market.

Questionnaire:

Why did (would) you not apply for a formal loan?

Constraint Status

Unconstrained (Price Rationed)

A I do not need a loan.

B The interest rate is too high.

C Farming does not give me enough to repay a debt.

D I prefer working with my own liquidity.

Constrained (Risk Rationed)

E I do not want to put my land at risk.

F I do not want to be worried, I am afraid.

G Formal lenders are too strict; they are not as flexible as informal ones.

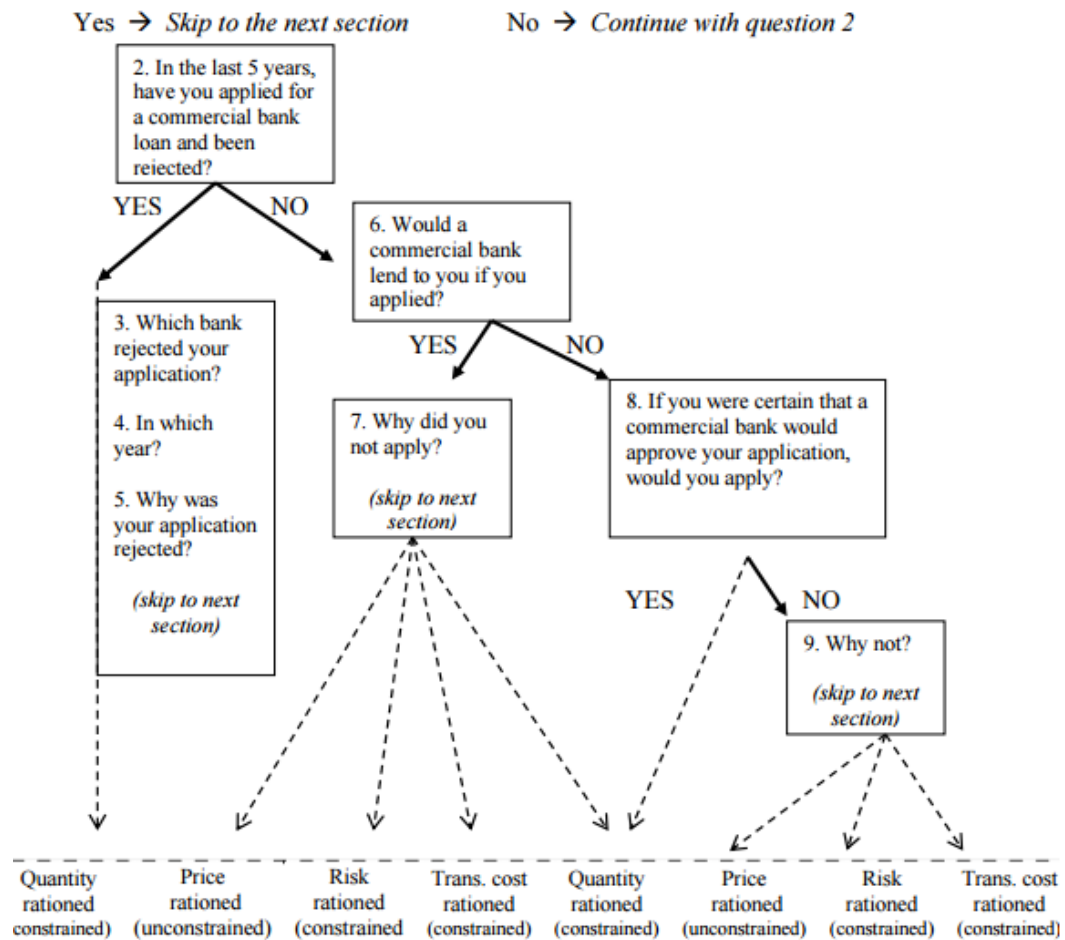
H Formal lenders do not offer refinancing.

Constrained (Transaction Costs with loan application are too high. Rationed)

I the branch is too far away.

J There is too much paperwork; the costs associated are too high

Figure 8. Sample non-borrower perceptions module



Source: Boucher et al. (2009)

After summarising the collected data, comparison analysis on borrowing behaviour and the preferences in terms of source of financing was conducted. During the second phase of the survey, the interviewees were questioned about feeding, management, marketing and value chain constraints, and their opinion on recent government innovative policy towards agriculture. The questionnaires can be found in Appendix A.

2.4 Methodology: case study 2

The second case study investigates the local conditions for agricultural extension services in Aktobe region. The survey was conducted with the help of “Damu Business Development

Fund” (DAMU)², which is the main provider of most extensive extension services in the region. The aim of the research is to assess experience of farmers with extension services and extension service providers, perception of extension administrators’ work, the methods for carrying out extension services in Aktobe region, and the main issues both parties face during their interactions.

The research work was conducted in the biggest district of Aktobe region, Kargalinskyj selskij district, with local farmers and DAMU office administrators. The survey was carried out in the form of semi-structured interviews.

The data collection process comprised two stages. First, I contacted the general phone number published on the web page³ of the DAMU Centre, I explained the purpose of my research and informed them that I have the reference letter from the local university to conduct research. Afterwards I was provided with the telephone number to contact a department that directly works with farmers in Kargalinskyj selskij district to schedule a meeting.

The department that provides extension services for the whole of Aktobe region is staffed by six people. The administrators provide their consulting services mainly from their regional headquarters in the city centre. The interviews were conducted with two officers who were responsible for the planning and organisation of extension services across the region and two officers who had experience working directly with farmers in Kargalinskyj selskij district.

I took an opportunity to attend one of their workshops in Kargalinskyj selskij district on Tuesday 16 August 2016 at 16:30. It helped me a lot to get in contact with more farmers in the district and surrounding areas. I approached six farmers attending the seminar during that day for a short interview related to their experience with the provision of extension services. However, I should note that I did not only find contacts with help of the DAMU centre, but also met other six farmers in the same districts with no connection with the centre. Hence, I believe this affected the outcome of the survey, as different perspectives were covered. A total of 16 interviews were provided. Four were informants working at the DAMU centre, and the rest were farmers with different experiences.

² The “Damu” Fund is the national development institute, created to contribute to the qualitative development of small and medium-sized businesses in Kazakhstan.

³ www.damu.kz

In the beginning of each interview I introduced myself and the nature of my current activities, which motivated them to share information on their working activities. The first interview took more time than initially planned, because respondents had long answers and had tendencies to talk about their general problems rather than answering the questions. In this situation, I followed the suggestion of Laforest (2009) to bear in mind that the interview plan should be used in a flexible manner: *“It can be adapted, if necessary, to the topics the interviewer seeks to explore, the type of information being interviewed, and so forth”* (Laforest, 2009, p.7). Afterwards, to improve the quality of the answers in terms of their structure and information I started to make small introduction to the problem before the discussion and make sure that interviewee understood the question, and after each topic I did a small summary of findings. Questionnaires are included in Appendix B. The interviews were taken in the Russian and Kazakh languages.

The assessment of the extension activities provided by the DAMU centre and its overall performance within the agricultural innovative system in Aktobe region was conducted according to the questionnaire developed by Birner (2009). The questionnaire addressed a current state of agricultural production in Aktobe, general questions about farmers, their expectations and requirements with regards to the regional innovation system, and their attitude towards innovation (Appendix C).

3 The development strategy in Kazakhstan’s agro-food sector

This chapter provides an analysis of the policy approach of the government support measures for agricultural sector:

- Kazakhstan 2050
- Program for the Development of the Agro-Industrial Complex (AIC) in the Republic of Kazakhstan for the years 2013–2020
- State Program for Accelerated Industrial and Innovative Development of Kazakhstan until 2020.

The analysis is based on the policy cycle concept, which relies on the evidence-based approach – monitoring and impact assessment – to identify priorities and limitations of adopted policies.

3.1 Sectoral program

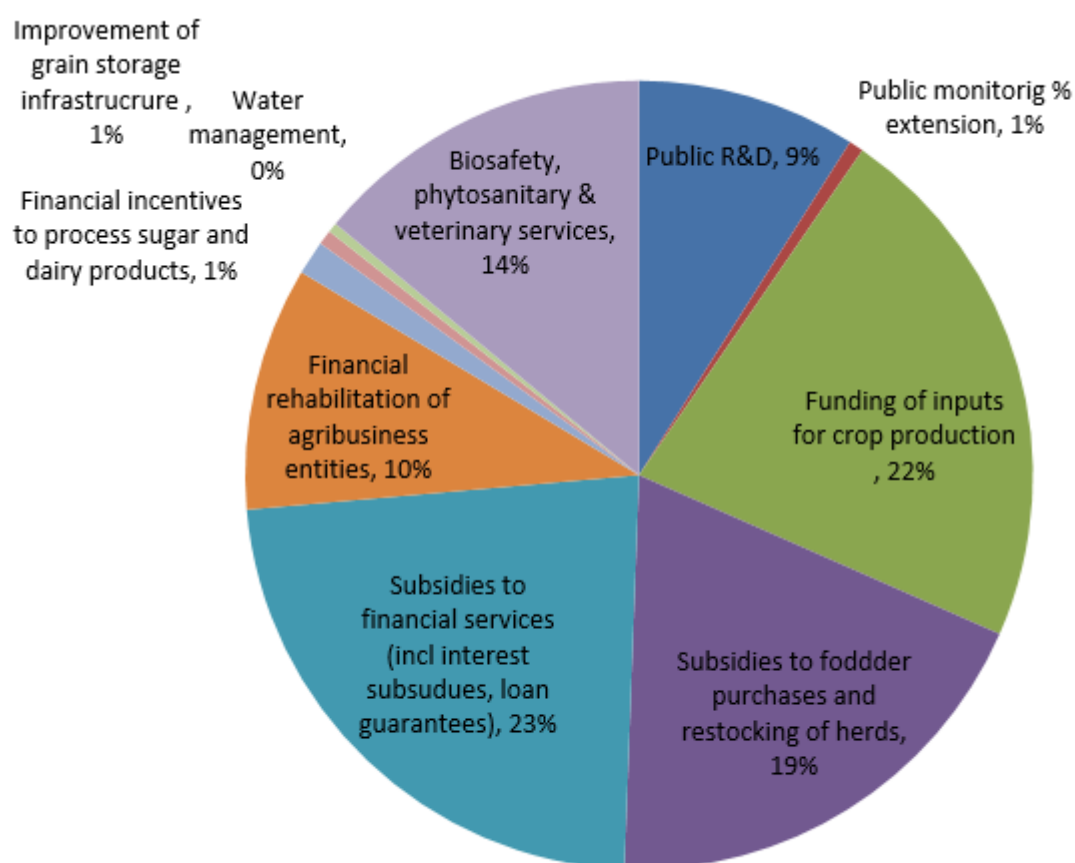
The agriculture sector is one of eight priority sectors in the context of economic diversification. For this purpose, the Program for the Development of the Agro-Industrial Complex (AIC) in the Republic of Kazakhstan for the years 2013-2020 (hereinafter Agribusiness 2020) was approved in February 2013 to address issues related to national food security, production and export.

According to the main strategic document, Kazakhstan 2050 calls for “*a large-scale modernization of the agricultural sector*”, which requires the expansion of sowing area, an increase in the number of livestock, and an increase in productivity growth through the introduction of new technologies. The Strategy includes new mechanisms to align social and economic imbalances of rural and urban regions and introduce modern water-saving agricultural technologies. It also includes some specific quantitative goals to force agricultural development, e.g. the level of state support should increase by 4.5 times, and the share of agriculture in GDP is targeted to grow by a factor of five until 2020. The weight of small and medium enterprises in annual agro-food production is expected to double by 2050.

In general, Kazakh national strategic documents are not mere proclamations of policy goals and instruments. For example, the sectoral program for “Agribusiness 2020” introduces an analysis of the current development of agribusiness in the form of a SWOT matrix for the Kazakh agro-food sector. The matrix of SWOT analysis is reproduced in Appendix D.

The SWOT analysis proposed by the Ministry of Agriculture of Kazakhstan captures important constraints and looks realistic and balanced. According to summarised weaknesses and threats in the SWOT analysis (see Figure 9) it is clear that the government is aware of dangers that agriculture may cause to sustainable use of natural resources. However, it is worth noting that sustainable usage of natural resources and rural development are not included in the sectoral program.

Figure 9. Budget priorities of the Agribusiness 2020 program



Source: Author’s calculations based on Agribusiness 2020 policy document, pp. 77-96

The Agribusiness 2020 strategy document sets four objectives with specific details of the individual action plan with the aim to enhance agricultural competitiveness. The objectives are accompanied by quantitative indicators and aim:

- to improve the efficiency of government regulation in the sector
- to develop the governmental service supply system for agricultural entities
- to improve access to material inputs and services
- to finance rehabilitation of agribusiness.

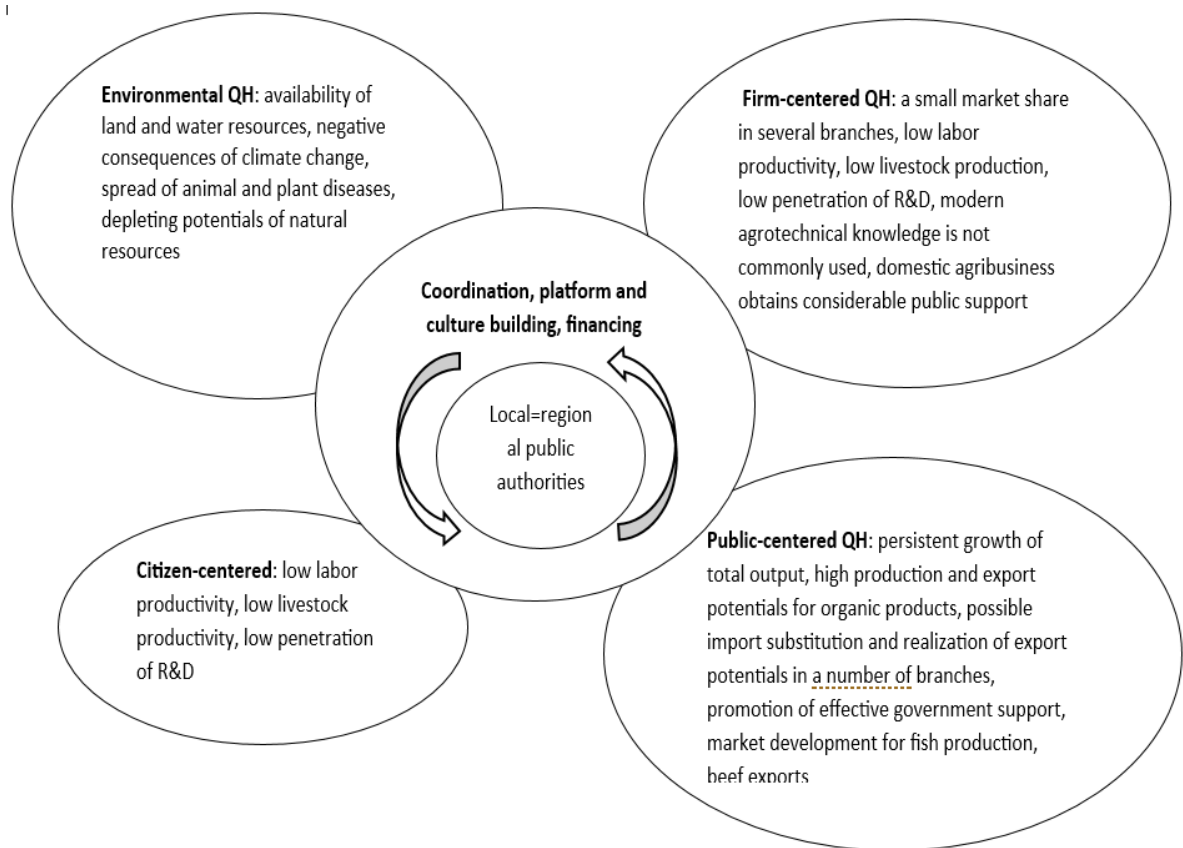
According to the program of Agribusiness (2020), the Ministry of Agriculture plans to gradually move from direct support of certain agricultural products to more general support via credit and leasing arrangements (Agribusiness, 2020, p. 54).

Figure 10 presents a statement of indicative budget allocations for each of the actions and priorities of the program. A significant part of the overall budget was allocated to Akimats (provincial municipalities). The largest part of the budget was allocated to capital subsidies or direct capital transfers to agribusiness entities. Subsidisation is a key production factor necessity for the realisation of government targets. It refers to the funding of all kinds of fixed factors (livestock, fixed capital) and variable inputs (fuel, seed, fertiliser, plant protection, fodder), which takes up almost 75% of the budget.

A small share of credits is planned to be channelled through commercial institutions in the form of long-term loans, and the rest will be expended by the subsidiary organisations of KazAgro holding (Agribusiness, 2020, pp. 49-52). Only 25% of the budget is dedicated to genuine public goods of the agricultural sector, such as public R&D and biosafety control.

The key issues stated in the SWOT analysis, such as public grazing land and water management, were either disregarded or received minimum budget allocation. Scant funding was also dedicated to institutional building, which was also addressed in the program in context of the embeddedness and accountability of governmental bodies.

Figure 10. QH models for Kazakhstan



Source: Own elaboration with an inspiration of Amkilet et al. (2013) (see chapter 1.3.1) and SWOT analysis of "Agribusiness 2020" for Kazakhstan

According to the government programs for agricultural development, the Ministry of Agriculture and its executive bodies are provided with a vast variety of fundings to support their activities. However, the SWOT analysis mentions that bureaucratic procedures, inflexibilities and outdated knowledge capacity of authority and its executive figures prevent from smooth operationalisation of the government plan. This indicates that the authorities at all levels face a two-sided problem, which is to renew capacity building of its staff responsible for promotion of the "innovation ecosystem" and to promote the "innovation ecosystem" itself.

Figure 10 attempts to identify the current stage of development, challenges and opportunities by means of the QH models. Four QH models were identified:

- (1) Firm-centered QH
- (2) Public-centered QH

(3) Citizen-centered QH

(4) Environment centered QH models.

Each QH model has its own main goals and types of innovation it aims to produce. In contrast, public authorities have different sets of skills to fulfil partly overlapping and supportive roles.

This analysis shows that to overcome such a mismatch in terms of budget allocation and of national priorities stated in the Agribusiness 2020 strategic document, there should be an improvement in cooperation and agreements among stakeholders of all the QH modes presented in Figure 10. Each mode explores its current position and shows what it can offer to the innovation system, and could be used as a “thematic tool” to explore the situation and to design an innovation network action plan for its execution. The developed QH model proposes that regional and local authorities should take the role of coordinator and platform builder in order to create dialogue among various stakeholders, assuring their participation. Although the Agribusiness 2020 document was discussed among the interest groups and private sector associations during the drafting stage, collective action of private stakeholders in agribusiness is very limited (Petrick, Oshakbaev and Wandel, 2014). These activities tend to be underfunded and their benefits receive little appreciation (OECD 2013, p 120). The success of the programs is measured by accomplished benchmark indicators given in the Agribusiness 2020 document. In this regard, Petrick, Oshakbaev and Wandel (2014) argue that it is not clear how indicators such as “hectares covered by subsidies” or “number of livestock bought under the national program” can contribute to the overall policy goal of increasing competitiveness, nor is it clear what role such indicators may play in the future review of policies.

In general, there are positive aspects of the Agribusiness 2020 program, such as a focus on the non-oil sector, which provide a basis for export growth, employment and adding value. However, the analysis shows that one of the main flows of the initiative is that the Kazakh government develops and conducts the programs in isolation, which brings a lack of enthusiasm among business entities in general. The planning process creates the learning processes, and facilitates change in the entities who participate in it. Also, each initiative needs to have a plan on how to inform and involve people who might potentially support it. The government separates interest groups and private sector associations from the decision-

making processes. It determines exactly which types of inputs should be used and by whom. The development institutions aim to involve interest groups and private sector associations in governmental plans. However, the capacity of the private sector does not always match government expectations.

In contrast to endogenous economic growth suggestions, the Kazakh government's role is not limited to providing a discussion environment between various stakeholders, and providing overall favourable economic conditions. It explicitly provides protection and targets subsidies to propel the sectors into certain directions. This approach corresponds to a new scope of '*new principles of economic policy*' named "*all around economic pragmatism based on the principles of profitability, return on investment and competitiveness*" (Kazakhstan 2020, p.1) and underscores the importance of government attitudes to enhance agricultural competitiveness (Prime Minister of Kazakhstan 2013).

The next section explores the institutional structure of development institutes and their activities through the historical analysis of financial support that was provided to the agricultural sector in Kazakhstan.

3.2 Influential intermediaries of Kazakhstan

According to the definition provided by Tastenova (2007), Kazakh **development institutions** are 'intermediaries between government and business. They are established at government level to carry out activities in accordance with government economic priorities to develop competitive economy'. The intermediary institutes have certain structure, power and functions and receive significant public funds that aim to finance business projects to achieve the competitiveness of the national economy. The Kazakh government participates in projects targeted to develop integrated production systems and manufacture competitive products through these types of institutions. The aim of government interventions is to develop a technological and economic value chain, and create diversified enterprises working on products that meet all competitive requirements (Tastenova, 2007).

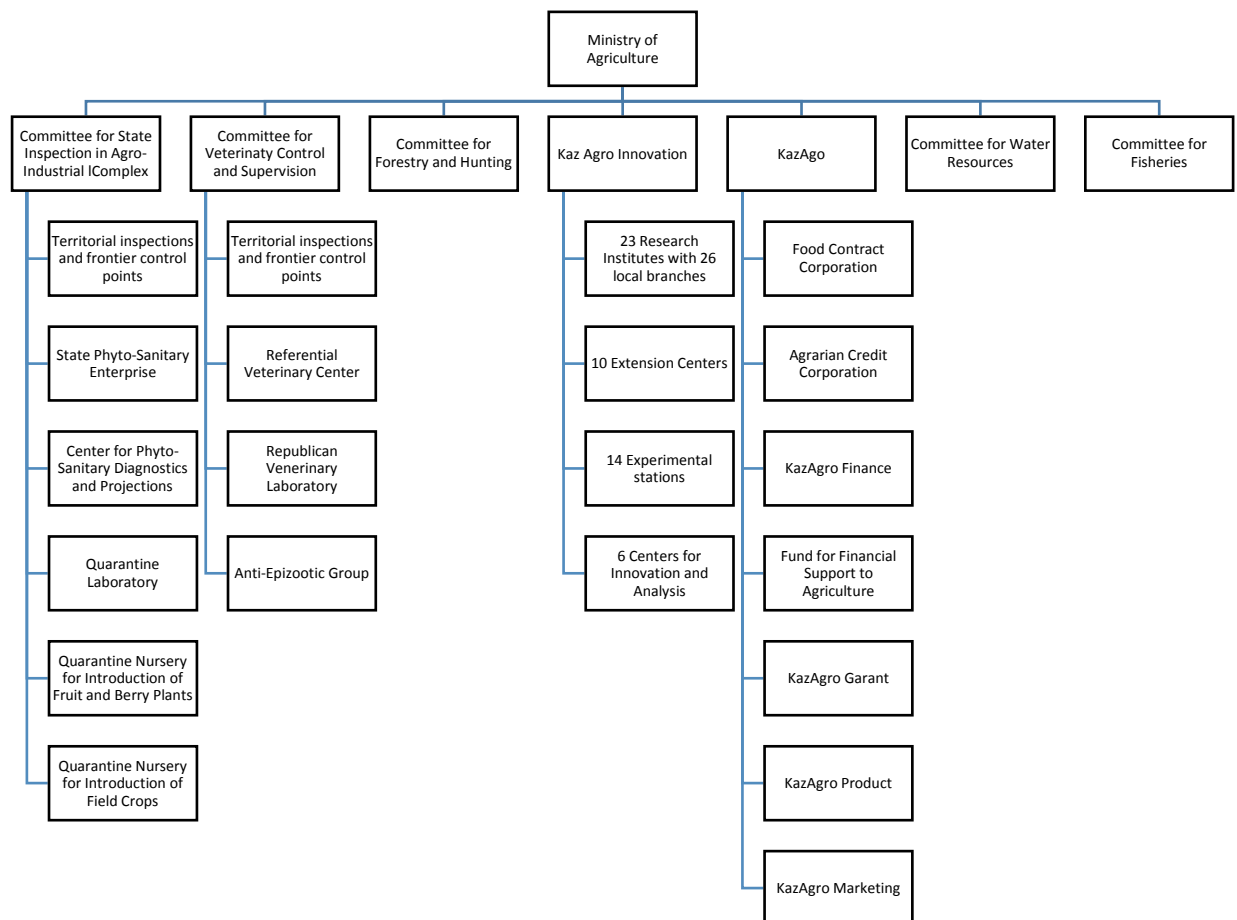
Development institutes were first established in 2006 in Kazakhstan with the aim to improve institutional management within the framework of "State Program for Accelerated Industrial and Innovative Development of Kazakhstan until 2020". The Ministry of Agriculture established JSC "KazAgro Holding" and JSC "KazAgroInnovation" with the aim to promote

efficiency in agricultural sector development through the merger of all agencies previously operating in various fields of agricultural policy under their umbrella.

Figure 11 presents the structure of the subsidiary agencies of the Ministry of Agriculture of the Republic of Kazakhstan. The Ministry of Agriculture develops agricultural policy, which is implemented by its subsidiary organisations. The responsibilities for subsidy distributions are carried out by the department of agriculture in the regional municipality (Akimats), as well as the national holding KazAgro and its subsidiaries that provide concessional loans, leasing of machinery, insurance etc.

Scientific support of agriculture is provided by KazAgroInnovation and its agrarian research institutes, branches, and experimental stations distributed throughout the country. The Committee for Government Inspection in the Agro-Industrial Complex and its subsidiaries carry out the control and supervision in phytosanitary field. Control and Supervision in the veterinary field is implemented by the Committee for Veterinary Control and Supervision. According to the annual report of the Ministry of Agriculture (2016), the total assets of KazAgro were 3,5 billion USD at the beginning of 2016, of which around 90% were concentrated in only three companies, Food Contract Corporation Joint-Stock Company (FCC), KazAgroFinance (KAF) and Agrarian Credit Corporation (ACC). These subsidiary agencies have major shares in the sector, and besides acting as government agencies that implement support programs, they also perform commercial operations.

Figure 11. The structure of the subsidiary agencies of the Ministry of Agriculture of the Republic of Kazakhstan



Source: Own elaboration according to official website of Ministry of Agriculture RK

The government of Kazakhstan sets activities of agrarian subsidiaries under the Ministry of Agriculture. Other ministries have a rather indirect influence on agricultural policy, for instance the Ministry of Economics regulates rural development. According to the decree given in “Strategy 2050”, in 2016 the three biggest agricultural universities were transferred under the umbrella of Ministry of Agriculture to ensure their competitiveness and integration into the international research and education community. These universities are the Kazakh Agriculture and Technical University named after S. Seifullin, Kazakh National Agrarian University and the State Enterprise West Kazakhstan Agrarian Technical University named after Zhangyr Khan. A range of issues were discussed on changes in quality management of the academic environment in relation to their autonomy (Edgekz). Yet the government of

Kazakhstan remains firmly convinced that merging top universities under the ministry will form a national scientific, educational and innovative system in the agro-industrial complex and increase the efficiency of agricultural production, science and training, as well as develop the infrastructure of agricultural science and education to an international level and ensure its proper functioning (Yespolov, 2013). All strategic plans of governmental bodies are adjusted to priorities laid out in the annual addresses of the President. Therefore, one can note a highly top-down hierarchy in the policy formulation from the President's Strategy 2050 to national programs for development and sectoral programs.

Analysis of Government Support for Agriculture

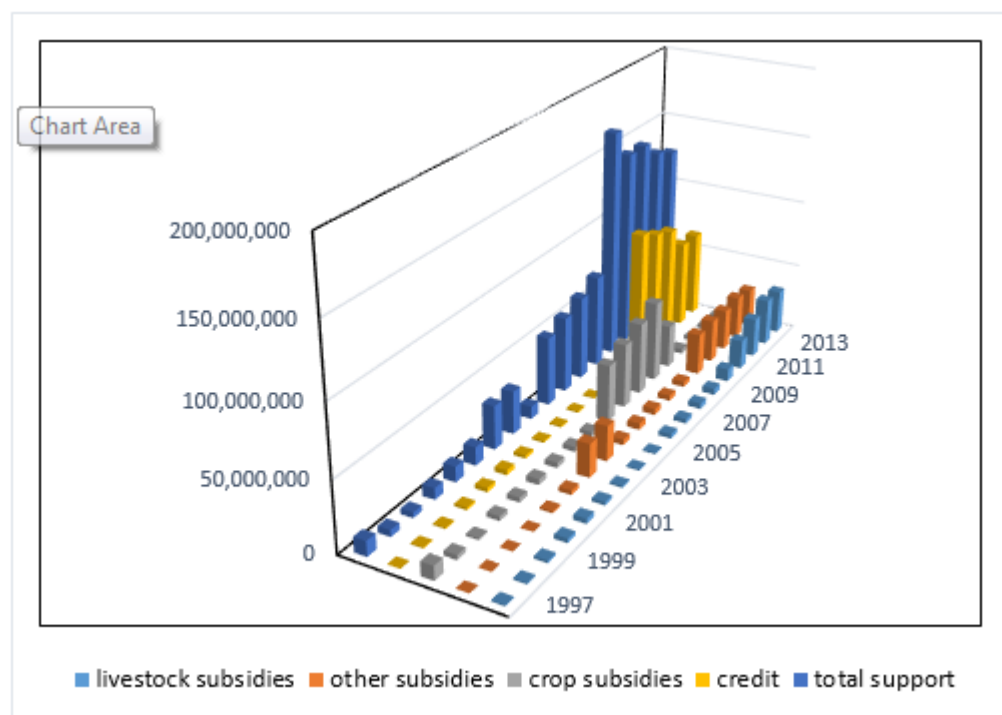
During the first decade of independence (beginning of the 1990s), the main domestic instruments to support the agricultural sector were government purchases and a few input subsidies, which coupled with non-tariff trade regulations, such as export and import licensing, and export restrictions. After the 2000s, the scope of policy instruments became more diverse, and included per ton/hectare payments, market price interventions, fertiliser and chemicals subsidies, concessional credits and many others.

In 2012 in the 'Program for Development of Agro-Industrial Complex in the Republic of Kazakhstan in 2013-2020' (Agrobusiness 2020) several master plans were introduced. These plans provided a comprehensive framework for sectors of development, measures of financial rehabilitation for the agricultural sector, and contained proposals on the reform of the state-support credit system. The government plans to allocate an aggregate of USD 21 billion (KZT 3.1 trillion) over the eight years of the program's implementation, of which 5% will be provided by Food Credit Corporation (FCC), 10% from the emission of government securities, 7% from local budgets, and 80% will be provided from the national budget. The budget addresses four streams of agro-industrial complex support: financial support (1%), development of government support (12%), enhancement of the efficiency of government regulation (3%), and 84% will be allocated to improve accessibility of products and services, which is essentially subsidies.

Budget expenditure for the Ministry of Agriculture (MOA) increased by more than 980 percent in real terms from 1997 to 2015, compared to a 370 percent increase in overall public expenditure. For the period 2012–15, the MOA expenditure averaged 5.9 percent of total

public expenditure and 31 percent of agricultural GDP. Most of the expenditure was for subsidies (34 %) and investment (36%) for the period 2012–15.

Figure 12. Budget Support for Agriculture (Real prices) in Kazakh Tenege (thousands)



Source: Own elaboration according to official website of Ministry of Agriculture RK

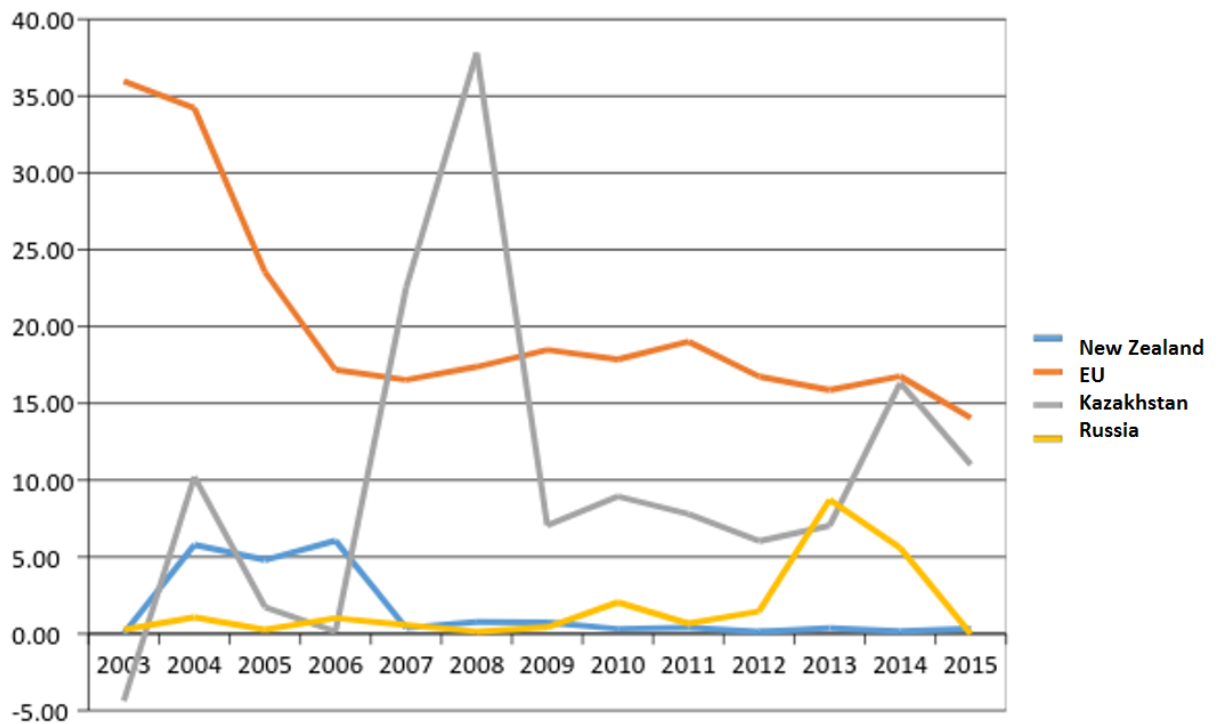
High and increasing direct budget support for the agriculture sector is highly unpredictable in terms of forms and focuses of support, which creates risks, especially to farmers that heavily rely on government support. Eligibility requirements for subsidies and credit keep changing, depriving farmers of access to subsidies that influence their investment and management decisions. Between 2005 and 2009, government support was mainly provided through direct subsidies, while in 2010 it was suddenly replaced by a new credit program. Similarly the focus on crop production between 2005 and 2009 was replaced by livestock subsidies in 2010 and elimination of crop subsidies by end of 2011 (see Figure 12).

The risk analysis of the WB (2016) showed that Kazakh crop production is more vulnerable to risk than livestock due to its exposure to drought. However, it is not the most severe risk in comparison to exogenous price shocks, which occurred in 1995, 1998, 2010, and 2012.

Inefficiency of agriculture development and government support in Kazakhstan can be documented by the index of producer support (PSE - Producer Support Estimate). The PSE

referred to the annual monetary value of transfers from consumers and taxpayers to agricultural producers and was published by OECD. Since the 1980s, there has been a gradual decline in the value of PSE in the biggest economies of the OECD (Pěluha, 2014).

Figure 13. Development of Producer Support Estimate (% PSE) for selected OECD countries
(in %)



Source: Own elaboration according to OECD database (2016)

Figure 13 presents the gradual decline of agricultural producers' support in the EU (28); New Zealand provides minimum support after radical and successful reforms in its agriculture sector (Pěluha, 2014). Russian state agricultural policy during the 2000s advantaged large-scale agricultural enterprises and Russian investments policy mainly targeted the agriculture sector. Even though this development did not lead to major improvements in techniques, managerial approaches, technology use or productivity, it improved the Russian national budget. In comparison to other countries, Kazakhstan has the most unsustainable and vulnerable path. Figure 13 shows that producer support is mainly based on instruments that create distortion and inefficiency to increase producer income. During 2007 and 2008 the country experienced a food crisis, during which world prices for agro-food products rose sharply and the government had to subsidise agriculture to prevent these external influences.

There are also some misconceptions around the function of government agencies in the institutional system. It is supposed that the primary function of such agencies is to implement an agricultural development program in the country. Yet, Kazakh government agencies are also empowered to undertake commercial operations. Therefore, the agencies have substantial market power today, as they operate on the agricultural credit markets, machinery leasing and grain. Thus, the dominant position of government in the market of agricultural products crowds out and suppresses private business.

3.3 The emergence of SMEs in the new economic era

Firms are the most important institution of the market economy. Firms that existed during the planned economy are incompatible with the new economic environment in Kazakhstan. Therefore, it was necessary to import this institution from Western economies during the transition period. However, this whole process faced major obstacles, as the most of property was not privatised by outsiders, but by insiders of the country. As the result, effective private ownership has never been established in Kazakhstan, and this largely determined the current slow and painful period of transition to a market economy.

Under these circumstances, there was an established phenomenon termed **‘economy of individuals’** (Kleiner, 1996). This phenomenon describes the separation process of personal interests from the interests of businesses, and personal wealth from company property. It is a paradox situation where transactions take place in the interests of the individuals and to the detriment of companies, even if those individuals are the rightful owners of those companies. Furthermore, the absence of institutional boundaries released business from government restrictions and created an environment that permitted them to make money by any means. Hence, it is not surprising that domestic business has acquitted some criminal and immoral shades. Therefore, one may conclude that institution of transparent companies that benefit from the trust of partners, lenders and investors in Kazakhstan has not completed its formation.

Agrarian transition

Following the disintegration of the Soviet Union in 1991, Kazakh agricultural policy went through three stages of adopting the most neoliberal policies. According to Toleubayev

(2010), these stages did not reflect any logical evolution of policy, but rather ideological consistency and policy uncertainty, both of which contributed to the agrarian crisis (Toleubayev, 2010, p. 356).

The first wave of privatisation that started in 1992 did not result in many actual changes in farm structure and ownership, as privatisation remained confined to paper. The second stage involved expanded privatisation and a rise in the amount of privately-owned property. The law adopted in 2001 known as “On Land” reduced usufruct rights and obliged holders of land titles to personalise their plots within three years. The third stage began in 2003, when the new law ‘Land Code’ turned agricultural land into a commodity.

The neoliberal reforms dragged the country into a long-term agricultural crisis. The control on farm prices and liberalisation of input prices drove many farms into debt (Gray, 2000; Peabody et al., 2000). Lack of clarity about the direction and the scope of the transition process gave local administration great room for manoeuvre. The transition led to the appropriation, dismantlement and sale of agricultural assets, which resulted in unequal distribution and accumulation (Toleubayev, 2010).

A review of literature highlights a few main reasons for the agricultural crisis of the 2000s, among them were inadequate transition policies and weak governance. The executive government bodies did not provide adequate information and assistance to farmers about a new land legislation. Grigoruk (2006) argues that 126 agricultural cooperations collapsed in 2004, because rural title-holders were not familiar with legislation, and panicked due to the rumours spread claiming that land-title holders had to buy their plots immediately otherwise they would lose their entitlement. That situation created speculative manoeuvres that help land dealers buy land for very cheap prices.

Today nostalgia arises from the loss of material and social infrastructure not only in Kazakhstan, but also in other former communist countries (Koznova, 2004). During Soviet times, collective farms were economic productive institutions providing social and material life. Toleubayev, Jansen and Huis (2010) investigated the practical content of nostalgia narratives, in other words, what people consider to be ‘good farming practice’. Major components of this content were investigated: labour organisation and division of tasks, the level of mechanisation in farming, and specialisation and coordination within a knowledge structure. The authors found that the agricultural crisis resulted not only in destruction and

depletion of the material and economic infrastructure, but also loss of knowledge and understanding of how to operate under new conditions. The transition period shifted *'highly mechanized farming to manually performed operations; a highly-developed division of labour in collective farming to one where individual farmers face the challenge of generating the multidimensional knowledge and skills needed to run a farming business'* (Toleubayev, Jansen and Huis 2010, p. 373). The knowledge and skills were not passed to the new generation due to lack of training and unattractiveness of the agriculture sector in monetary terms. Toleubayev, Jansen and Huis (2010) conclude that access to land, labour and machinery alone is not a sufficient condition for agriculture success. They suggest that knowledge should be *'conceptualized theoretically as a structuring component, as important as control over land and labour'*, and not just an *'epiphenomenal element of the agricultural labour process'* (Toleubayev, Jansen and Huis 2010, p. 372).

Their findings are similar to Benton's (1996) proposal that the intrinsic structure of labour processes requires reevaluation to cover more elements in the labour process than previously recognised in Marxist theory. In this context, Stone (2007) argues that the agrarian crisis in Kazakhstan is partly a performance crisis, because agricultural practice is much more dynamic than factory work, and the ability to make use of technology under variable conditions is much more important than simple mechanical application of knowledge or binary decision-making, such as to adopt or not to adopt.

The agrarian transition period in Kazakhstan caused a large decline of agricultural output after the collapse of the Soviet Union resulting from inadequate transition policies, weak government and **performance crises of Kazakh farmers**. Scholars incline to the idea that lack of operational knowledge and information about new circumstances on the market played an important role in the agricultural downturn. Because in a new market economy, farmers are required to possess multidimensional skills and knowledge to run their own businesses, which assumes a reshaping of their understanding of knowledge in labour processes and prompts a social transformation of agrarian structure.

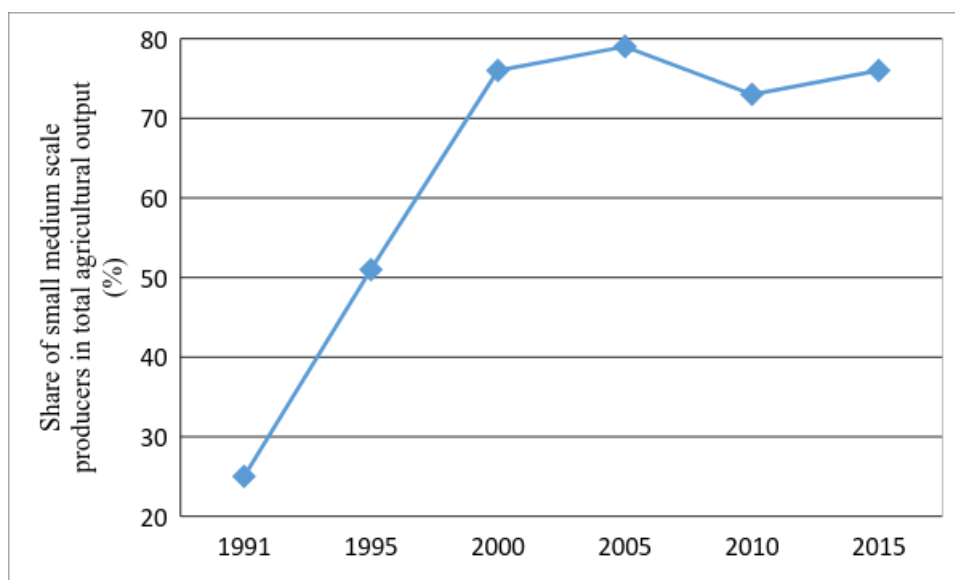
Small-scale agrarian enterprises

Privatisation and farm restructuring increased the number of farms from 5,000 in 1990 to 163,692 peasant farms and 72 experimental stations at the beginning of 2014 (Agency of Statistics of the Republic of Kazakhstan, 2015a, p. 186). There were 7,687 registered

agricultural enterprises by 2015 in Kazakhstan, with an average land area of 4,378 ha, which shows the decline in land hold by large-scale farms from 1991. There are 4,578 agricultural enterprises operating on an average land area of 43,112 ha. In 1991, large-scale agricultural enterprises produced 72% of agricultural output, and by 2015 their share had fallen to 32%, while the output of individual farms and households has been increasing (see Figure 14).

Between 1991 and 2016, large and small-scale farms became dominant producers of agricultural products in Kazakhstan. The reforms of land ownership and farm structure led to reallocation of production from agricultural enterprises to small-scale producers. It resulted in an increase in total land area for agricultural use by small-scale producers from 352 thousand hectares to 49.2 million hectares. It is worth noting that rural households are typically subsistence-oriented, while individual farms are often privately owned commercial operations that struggle to market their products (WB, 2016). There are 173,015 individual farms registered in 2016 that operate with an average land parcel of 311 hectares, while the number of rural householders amounts to 2.1 million, with an average land size of 1.15 hectares. Therefore, the statistics show that individual farms are more market-driven and adaptive to new changes than rural householders.

Figure 14. Growth of small-scale (individual farms and householders) agricultural production, 1991-2015



Source: Committee of Statistics, Ministry of National Economy of Kazakhstan (2016)

Studying the institutional development of companies in Kazakhstan, it is impossible to ignore the issues of concentration and centralisation of capital in large companies. Dudwick et al. (2007) argue that the Kazakh government is more favourable towards big farms rather than small, as most of the credits from commercial banks are directed to large farms. Csaki and Zuschlag (2004) found that typically bureaucratic requirements alone create a disincentive for smaller farmers to access government subsidies for purely economic reasons. Karadzhaeva (2007) highlights further evidence of this when the Kazakh government prioritised larger farms with respect to dispelled farm structure in livestock production. Even President Nazarbayev himself accented the need for larger farm units, which impulsed the government to direct more support towards large and more prospective entrepreneurs (Zakon.kz 2007, 2012 and 2015).

According to the Decree of the President ‘On measures to modernise the economy of the Republic of Kazakhstan for the period 2007–2030’ the government adopted the program of ‘Thirty Corporate Leaders of Kazakhstan’. The program’s goal is to consolidate the efforts of business and government to establish new and modernise existing enterprises to ensure the diversification and development of export potential of non-oil sectors of the national economy. Urmanov (2007) sees practical reasons behind this development direction, as the government can realise the support measures in a more efficient and easier way, having only a few large entities instead of dealing with a fragmented structure.

The analysis shows that during the period of transition to market economy, small-scale farming has been intensified in the region and their total annual product output is second after large-scale agricultural enterprises. Small-scale farms often do not have a chance to get government support, but nevertheless their dynamism in the market shows their ability to accept new market conditions and trends. However, the government of Kazakhstan set a priority to establish agro-holdings for large-scale production, which would be easier to coordinate and subsidise. The activities of small-scale farms are planned to be integrated with large-scale farms within the framework of sectoral clusters. In other words, the reverse process is taking place in the history of Kazakh agricultural development. After numerous reforms, the government is now trying to return to large-scale production of agriculture.

Literature on institutional voids (Ashwin, 2012; Schrammel, 2014) argues that in general companies in transition countries find their business environment particularly difficult. The

transition process itself creates multiple barriers for smooth operation due to the ongoing adaptation of the institutional environment from one system to another (Lehmann & Benner, 2015). Especially, the transition process puts small and medium enterprises (SMEs) at competitive disadvantage, mainly through mismatches of formal and informal practices in capital and labour markets, and contract enforcement. Voids in the capital market are linked to missing or insufficient capital provision (see Case Study 1), while in the labour market they refer to missing systems of specialised training or education (see Case study 2), and contract enforcement is impeded by the issues arising from insufficiently staffed judicial systems or poor alignment of law (Richart et al., 2004; North, 1990; Mair et al., 2009).

Gradher and Stark (1997) link institutional voids to ‘transformation costs’. They argue that political and economic transitions incur some transformation costs. Therefore, the government should take the additional role of bridging fundamental institutional voids to reduce SMEs’ transaction costs.

3.4 Institutional voids and innovative activities

The institutional environment plays a critical role in the promotion of innovative activities. Innovative development is largely given by the nature of formal (rules, regulations, laws) and informal institutions (public standards). The development of these institutions is a very complex process that requires mutual evolution.

Freeman (1995) argues that innovation can be supported through the development of formal institutions, and eventually the level of their development affects the formation of informal institutions. Thus, low levels of government support towards science, education and innovation lead to a low status of professionals in those sectors. At the informal level, low status in the perception of scientists, teachers and others is developing.

Informal institutions are largely determined by the features of socio-cultural development and generate specific behaviours, which are reflected in choice of profession, and attitudes towards professions, partners, competitors and others. Among informal institutions, such norms as trust and honesty play an important role, as do the norms of socialisation given by national mentality that help maintain the integrity of society. The lack of trust can be a hindrance to innovation initiatives and partnership formation between science, business and

government, and the ethical trust reduces transaction costs and can be regarded as a competitive advantage (Fukuyama, 2004).

Fukuyama (2004) argues that in societies where people do not trust each other, interaction is usually based on formal rules and regulations. This creates transactional costs in the form of relation to development, coordination and enforcement of the formal institutions. There are three types of societies with different formal and informal institutional settings: a collectivistic society with higher degree of trust (Germany and Japan), feministic society where family and various forms of related association and voluntary association are typically weak (China, Italy, France, Taiwan, Hong Kong and Kazakhstan), and individualistic societies, where family and voluntary associations are weak, but criminal groups are strong (Fukuyama, 2004, p. 730).

Social and political institutions play an important role in innovative development. However, to carry out social innovation to establish institutions like banks, stock exchange, universities and government agencies is far more difficult than it is to introduce a new technology or equipment to the market. Drucker (1992) argues that institutions require deep cultural roots, for example, Japan has set a goal to create a 'progressive' social institution that will remain quintessentially Japanese and fit into the scope of the 'Western' highly industrialised economy' in the twentieth century (Drucker, 1992, p. 350).

According to Freeman (1995), the institutional system is a network of institutional structures in the public and private sectors, and interaction among them contributes to the diffusion of new technologies. The degree of institutional development to innovate can be evaluated using four criteria: expenditures for R&D in terms of GDP, the share of industry in funding research and development, the development of the electronics industry, and the level of foreign direct investment (Freeman 1995, p. 5). The criteria were implemented in Table 6 to evaluate the institutional environment of innovative development of selected Eastern European countries and to compare them with Kazakhstan.

At the first glance at Table 6, the type of institutional framework that was formed in Kazakhstan has some similar features with the first and second group. It is shown that there is a relatively high level of foreign investment in Kazakhstan on the background of a low level of spending on R&D, and an undeveloped electronics industry. However, this similarity can be considered as irrelevant, since the main priorities of the foreign investment policy of

Kazakhstan differ from those of the newly industrialised countries and emerging economies of Eastern and Central Europe. In Kazakhstan, foreign investments are focused on traditional sectors, primarily on the mining sector, while in the industrialised countries, foreign direct investments established base for development of new industries that became a catalyst for industrial modernisation.

Comparative advantages of the countries is one of the reasons for the different effects of foreign investment on the economic structure. For example, newly industrialised countries have abundant cheap labour, while Kazakhstan has raw materials. The countries with comparative advantages of cheap labour benefited from foreign investment through the development of labour-intensive assembly plants, and the availability of a skilled and educated workforce creates favourable conditions to develop the electronics industry in Eastern Europe.

The European Commission (2008) identified the main features of the countries with the highest GDP per capita (more than 20 thousand US dollars) that create a favourable environment for innovation:

- Compliance with contractual obligations, as a condition for reducing transaction costs;
- Tax system with a strong tax administration;
- Public service with a low level of corruption;
- Transparency of public companies and financial institutions;
- Public trust (the trust of partners, creditors, investors and public authorities in the institutions);
- Political system with developed democratic institutions (political competition, separation and change of power, the control of society over the state and the bureaucracy);
- Civil society cultivated from childhood obedience to the law and equality before the law;
- System of law enforcement and the court, credible citizens;
- Minimum gap between the formal and informal social behavior norms.

Studies (North, 1990; Ashwin, 2012; Schrammel, 2014) emphasise the slow evaluation of informal institutions. The existing informal institutions and culture in the broader sense should be taken into consideration during the formation of policy in the field of innovative development and modernisation. The pace of innovative modernisation of a country is largely linked to the flexibility and variability of institutions and the gap between formal and informal institutions. In Kazakhstan, the structure of formal institutions supporting innovative development is very complex, but their impact on innovative development remains weak (Table 7).

Table 6. Assessment of favorability of institutions to innovate in newly industrialised countries and Kazakhstan

Indicators	Types of institutional system		
	Newly industrialised countries: Hong Kong, Korea, Singapore	Countries with economies catch-up: Eastern and Central Europe	Kazakhstan
Countries			
The share of R & D expenditure in GDP, %	1-2,5%	0,5-1%	Less than 1 %
	Republic of Korea - 3.7% Singapore - 2.4% Hong Kong - 0.79%	Romania 0.5%; Bulgaria, Latvia, Slovakia - 0.6%; Poland, Lithuania - 0.7% Hungary - 0.12% Estonia, Czech Republic - 1.6% Slovenia - 2.1%	Minimum - 0.15% Maximum - 0.28%
The funding of research in industrial sector, %	40-65%	50%	Less than 50%
	Republic of Korea - 73% Singapore - 53% Hong Kong - 45%	Slovenia - 61% Czech Republic - 53% Estonia - 53%	33%

		Hungary - 47%, Bulgaria - 30%, Poland - 27%	
Electronic industry	Export orientation, rapid growth, high competitiveness, own competitive brands	Developing a competitive industry, the promotion of European brands	Spot development, low competitiveness, lack of national brands
	Singapore - 48% of GVA (2010)	Poland - 1.7% of GDP Hungary - 25% of industrial production	Less than 1% of the total industrial output
Foreign direct investment, GDP, %	High penetration rate	Moderate level of penetration	High penetration rate
	Singapore - 26.7% Hong Kong - 36.2%	Bulgaria - 15.7%, Estonia - 10.3%, and Serbia - 8.3%	Minimum - 14,6% (2012), Maximum - 24% (2006)
Features of environment	<ul style="list-style-type: none"> - Favourable government policy; - Development of innovative infrastructure; - Cheap labour; - Favourable economic and geographical position in the Asia-Pacific region; 	<ul style="list-style-type: none"> - Stimulating public policy, - Relatively low-cost, highly skilled labour force, - Geographical proximity to major capital-exporting countries, - Developed transport infrastructure - Relatively low investment risk; - A large market 	<ul style="list-style-type: none"> -Active policy on creation of innovation infrastructure objects; -Shortage of highly skilled workforce; -Continental location, remoteness from world export routes; -Poor quality of transport infrastructure; -High investment risk, small market;

Source: The Global Innovation Index 2015 and National Bank of Kazakhstan (2015)

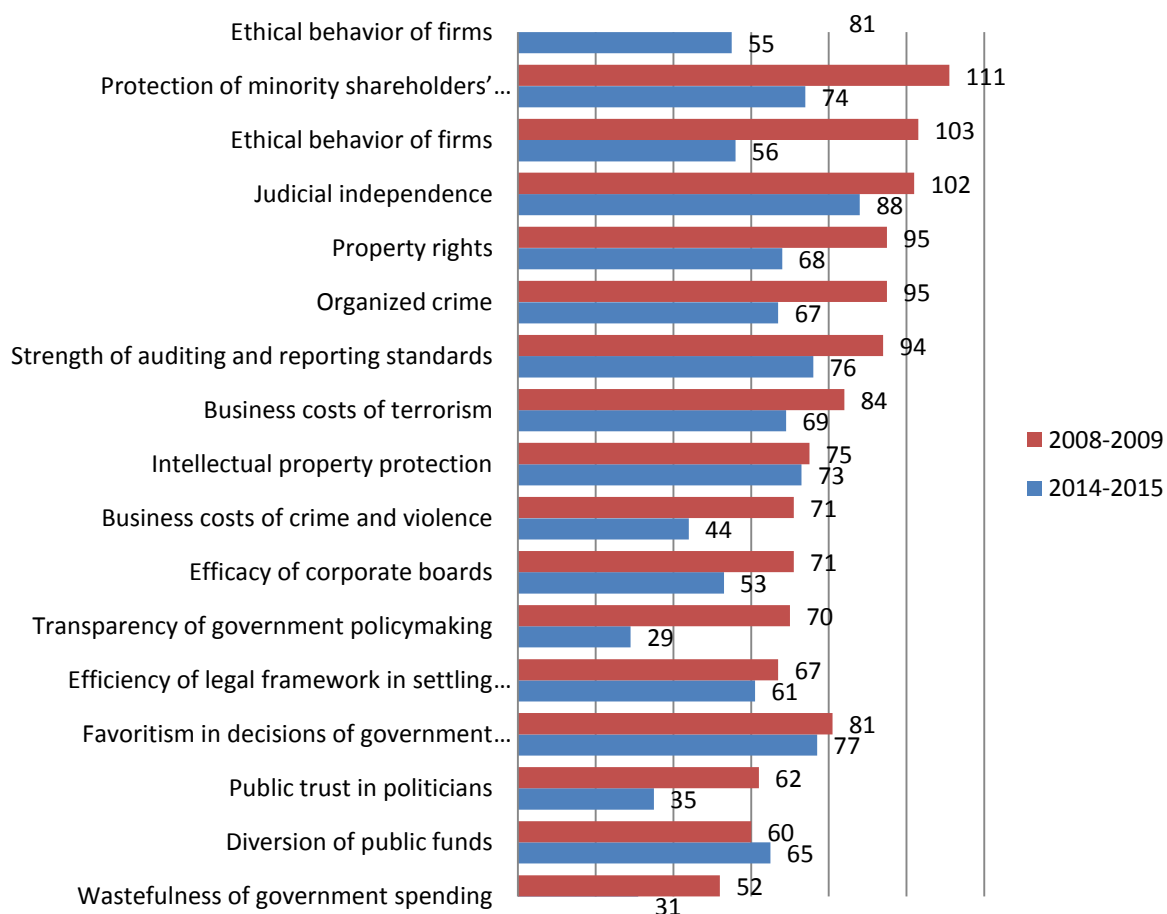
Table 7. Institutional environment of innovation activity in Kazakhstan

Institutes	Condition	Impact
Formal Institutes		
Legislation in the field of education, science, innovation, industrial development, intellectual property, standards	More than 100 laws, legal documents	Low level of spending on research and development - over 20 years it did not exceed 0.3% of GDP. Low level of innovative activity - 5.7%. (in 2014 and 2016 by 3.6% growth). Low level of spending on education - 3.1% of GDP.
Government and industry program	SPAIID and 25 branch programs	Low efficiency, weak protection of state interests, limited diversification.
Infrastructure for innovation	National and regional parks, shared laboratories, development institutions.	<p>Little impact on the level of innovative activity in general.</p> <p>The technological level of production.</p> <p>The expansion of human resources in the field of research, development and innovation.</p> <p>Low proportion of institutions in R&D and innovation.</p>
Human capital development conditions	<p>Individual measures in the Bolashak" International Programs Center.</p> <p>Educational grants. Prizes and scholarships in the field of science, grants for educators.</p> <p>Internship Program.</p>	<p>Limited scope of scientific knowledge.</p> <p>Low status of inventors and specialists in the field of science and education. Low level of financial motivation. There are no incentives to attract professionals in R&D or education.</p>
Informal Institutes		
Corruption, the informal sector,	Of the Law "On Combating Corruption" and "On	High level of corruption, growing number of corruption-

raiding	public service", the Decree of the President of the Republic of Kazakhstan" On the Code of honor of civil servants of Kazakhstan ", Sectoral Programme on Anti-Corruption for 2011-2015. "On amendments and additions to some legislative acts of Kazakhstan concerning counteraction to illegal seizure of businesses and property (raiding)", 2011	related crimes. Corruption Perceptions Index 2015 - 133 place among 174 countries. The informal sector in 2015 - 16% of GDP.
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Source: Author's findings

Figure 15. Assessment of factors of the institutional environment in Kazakhstan in the global WEF competitiveness ranking



Source: Own elaboration according to the Global Competitiveness Report 2008–2009 and 2014–2015

Shabanov (2013) suggests that every economic model has a set of institutions that differ from country to country and change with time, and also that systems of institutions for technological innovation support differ from one industry to another. Formal institutions of government incentives and restrictions, e.g. property rights, taxes and laws, determine the attitude of entrepreneurs and firms to innovate.

According to the global competitive report on institutions, Kazakhstan is placed in 55th position (WEF, 2015–2016). Improvements are mainly achieved in the spheres that were under direct government influence. Figure 15 shows that Kazakh institutions strengthened their bureaucratic procedures and anti-corruption practices. The share of shadow economy and the gap between formal and informal institutions remain significant. Besides the WEF's estimates, there are other approaches to assess the role of institutions in developing countries. Some of them are reflected in indices that form ratings (see Table 6).

Table 8. Characteristics of the institutional system of Kazakhstan in the estimates of world rankings

Indicators	Place
Corruption Perceptions Index	133 (174)
Global Peace Index	78 (162)
Rating prosperous countries in the world	46 (142)
Ranking of Internet freedom in the world	44 (60)
Human development index	69 (186)
World press freedom index	160 (179)
Ranking countries on the Index of charity	115 (145)
Happiness and Life Satisfaction	101(178)
Democracy Index	143 (167)
Doing Business 2013 ranking of economies:185 countries in the world	49 (185)

Global Terrorism Index	47(116)
Rating of economic freedom around the world	68 (177)

Source: The Global Innovation Index, The Global Competitiveness Report, The Happy Planet Index, The Legatum Prosperity Index , Freedom House , Charities Aid Formation , The Democracy Index , The Global Terrorism Index and The Heritage Foundation

Table 8 shows several contradictory estimates of low ranking on the level of perception of corruption and high ranking of business environment and economic freedom. The table also shows low scores of world press freedom index and life satisfaction. According to the rankings presented in Table 8, the institutional environment in Kazakhstan can be characterised as unstable, heterogeneous, and unfavourable for innovative development.

It is important to develop favourable institutional conditions for successful innovative development, such as business security, public, social and political stability, attractive investment climate, economic freedom and competitive markets, and effective and creative elite and society. The creative potential in the context of an unstable institutional environment with a low level of confidence, high level of corruption, low level of social well-being, and individual rights, converts to other forms and motivations like negativity, destructive and antisocial behaviour in society. In such an institutional environment, entities typically operate in accordance with other regulations, such as admitting tax evasion, failure to fulfil contractual obligations, defaults on deliveries and corrupt behaviour.

Generally speaking, innovative activity is associated with high risk, and results are usually derived in the medium and long term. Hence, stable public institutions, political and economic policy are important preconditions in this respect. An unstable institutional environment creates opportunities to violate social norms and property rights, and corruption manifests itself. It typically happens when the main objectives of domestic business have short-term goals and innovation is not considered to be a priority. Thus, speaking about the role of institutions, it can be argued that development of an innovative economy relates to the creation of a favourable and steadily evolving institutional environment. A stable institutional environment compensates the internal instability of the nature of innovation.

3.5 Institutional voids and intermediaries

The literature on institutional voids identifies that clusters have similar functions as intermediaries (Ashwin, 2012; Schrammel, 2014). According to Poter (2000a) clusters in Kazakhstan are *‘aform of industrial organisation where firms and associate institutional are interlinked in some way and geographically proximate’* (Poter, 2000a, p. 254). Michael Poter was an adviser for the Kazakh government in implementing cluster projects across the country. He suggested in January 2005 in Astana that due to *‘limitations in terms of financial sources and management capacity the Kazakh government should activate only a limited number of clusters’* (Wandel, 2014, p. 7). The selection of these clusters should be based on their ability to *‘meaningfully affect economic development’*, therefore the priority sectors were selected to have a potential of high competitiveness, while at the same time inevitably meeting national security interests (Wandel, 2010, p. 16).

Therefore, the emergence of clusters in Kazakhstan was not left to the competitive market process but a state-induced process.

In developed countries most food products reach clients in processed form, therefore the competitiveness of the national agro-food sector can only be reached through the development of the food industry (Government of the Republic of Kazakhstan, 2005a, section 3.3.2). According to expert, in Kazakhstan in 2014 almost 75% of all food products sold to the final consumer were unprocessed, while the share of processed agricultural raw materials amounted to only 32% in the meat sector (Ministry of Agriculture, 2015). Nonetheless, according to the annual report of the government program ‘Diversification of Kazakhstan’s Economy through Cluster Development in Non-Extraction Sector of the Economy’, the agro-food sector is one of the prospective branches that could improve its competitiveness by means of clusterisation.

Apart from outdated production technologies and import competition, lack of adequate high-quality agricultural raw materials remains a big issue for food processors (Expert Kazakhstan). Especially in the meat and dairy sector, where more than 93% of raw products are produced by small household plots (Agency of Statistics of the Republic of Kazakhstan, 2015, p.248) with primitive production technologies. To address those issues the government adopted Agribusiness 2020:

- (1) to regulate the internal market,
- (2) to industrialise agricultural production,

(3) to develop a modern social and physical infrastructure for the whole sector

(4) to promote branch clusters.

The Kazakh strategy for cluster development comprises different elements of industrial estates, organised networks, and large-scale technology parks regulated by a separate legal framework. Each cluster company is managed by a management company with professional staff. Management companies can be public, private, or hybrid. They function as one-stop shops for providing business development services to cluster companies and initiate collaborative projects between member companies.

The Entrepreneurs Council, which is responsible to the President and the unified Coordination Council for Entrepreneurship under the government are the main bodies responsible for development and setting priorities for clusters and SMEs in Kazakhstan. The Ministry of Economic Development and Trade is responsible for responsible for the transitional development of priorities towards policy coordination for the development of Clusters and SMEs . The Ministry of Industrial Development and New Technologies, and the Ministry of Economic Development and Trade are the main bodies responsible for the development and implementation of the government support program.

Furthermore, the government provides support to SME and Cluster development through several policy measures. These are ‘Business Road Map 2020’, implemented by the DAMU Entrepreneurship Development Fund and ‘Productivity 2020’, realised by the Kazakhstan Industry Development Institute.

Moreover, the DAMU Fund established the ‘Entrepreneurship Service Centre’ (ESC) in 2013 with the aim to supply SMEs with information and provide a wide range of services from company registration to finance opportunities, and also to connect companies with potential partners and other institutes to activate the networking and collaboration process.

The DAMU Fund is the program’s financial administrator, and was established in 1997 to promote the development of SMEs. Its sole shareholder is the state-owned Joint Stock Company ‘National Welfare Fund’ (Samruk-Kazyna) that has branches in all regions of Kazakhstan.

The 'Business Road Map' aims to provide financial support to new business initiatives, recover a sector, it also provides non-financial support like various types of consultations and training.

The Ministry of Regional Development has recently established a Partnership Program to facilitate the linkage between system-forming companies (which are usually large companies with state participation) and local SMEs.

The Social Enterprise Company (SEC) is another fully state-owned organisation that is responsible for the implementation of SME and Cluster support government policies and measures at the local and regional level. According to OECD (2013) this organisation is well placed to support the linkage program because of its mandate.

The above-mentioned organisations provide a wide range of services to promote SMEs and clustering. They are regarded as an attempt to bridge some of the institutional voids prevalent in Kazakhstan's economy. While the precise configuration of government institutions for cluster and SMEs development and the needs of enterprises in different industries may substantially vary, the networking options provided by Kazakh institutions offer to companies opportunities to bridge the institutional voids.

Business development services, like assistance in business management, have become a part of the standard repertoire of local and regional economic promotion in many transition countries. But socio-economic realities, such as weak entrepreneurial culture and attitudes, change in the long run and require more fundamental policy choices that are beyond the scope of cluster policy.

The role of the Institutes for SMEs and Cluster development in bridging Kazakh institutional voids relating to the prevailing uncertainty in the current transitional context should not be overestimated. Their ability to bridge some immediate institutional voids, the institutional environment for enterprises in Kazakhstan notwithstanding, is characterised by some more fundamental voids. Bridging them will require long-term macro-level policies. While the current institutes can bridge institutional voids on the meso-level, coherent macro-level initiatives are needed that should not contradict the role of clusters in improving the business environment for enterprises, and vice-versa. They can play a certain role in lobbying for such macro-level policies but their potential to do so seems limited due to the top-down orientation

of Kazakh cluster policy. Hence, allowing for the bottom-up formation of cluster initiatives is important.

However, in the medium and long term stronger institutional independence of the Institutes for SMEs and Cluster development might put them in a position to pursue effective advocacy for the needs of constituent enterprises, SMEs and start-ups. The current transitional environment and related democratisation and decentralisation efforts offer a chance for these institutions to take on such a role. Nonetheless, much will depend on their ability to achieve a certain institutional and organisational strength. When they succeed in bridging at least some meso-level institutional voids, it might become attractive for firms to coordinate their activities with developing institutions.

Furthermore, Kazakh cluster policy is not specifically targeted toward institutional voids in Kazakhstan. It is a role of Kazakh government institutions to bridge transition-related institutional voids. While the services provided by Kazakh institutions are quite typical for cluster initiatives around the world, they can still help overcome some of the informal institutional voids, such as lack of access to information and the network. According to Grabher et al. (1997) the effects of cluster policy in bridging fundamental institutional voids are not yet observable.

Formal institutional voids related to issues such as contract enforcement, the rule of law, or the protection of competition would need to be handled at the macro level. The role of Kazakh clusters in lobbying the reforms in this regard appears somewhat questionable, although the current democratisation and decentralisation process in the political arena opens a window to the opportunity for clusters to take a more active lobbying role.

It is worth noting that the State Program of 30 Corporate Leaders of Kazakhstan is officially supposed to compete with the cluster development initiative. 30 big players in various branches of the Kazakh economy, including food processing, were established to compete in both national and international markets, and at the same time become a catalyst of economic development for the rest of the economy. Wandel (2010) refers to the program as a process of picking winners, as the corporate leaders carry out concrete state investment projects in various branches for which financial support is provided (Wandel, 2010, p.25).

The Kazakh case study demonstrates the issues related to clusters and cluster policies in transition countries, which are often encountered when it comes to bridging institutional

voids. The analysis shows that Kazakh cluster-based economic development strategy is more of a political than a market decision, and the formal institutions environment in Kazakhstan is actively addressed by policy makers, while the informal embeddedness of existing policies is typically disregarded. Therefore, institutional voids create competitive disadvantages for the firms in Kazakhstan, especially for SMEs.

Clusters have a potential to bridge institutional voids during the time of transition, nonetheless, in long run, institutional voids should be treated at the macro level in Kazakhstan. Lobbying by a cluster manager can become an important tool for long-term treatment of institutional voids; however, this appears difficult, especially in the case of a top-down designed cluster policy.

3.6 Semi-conclusion

The agricultural reforms that started since the fall of the Soviet Union in Kazakhstan have produced mixed results, and caused further attempts to rethink the landmarks of institutional transformations. Among the principal lessons of the agrarian reforms is institutional deficit, and poor governance at local, national and regional levels.

As the analysis shows there are vertically integrated agro-sectoral formations in Kazakhstan. The cluster initiatives and the government program of 30 Corporate Leaders in Kazakhstan's agro-food sector shows that the government trust less in the competitive market process and its functions of 'discovery procedure' (Hayek, 2002). The Kazakh agricultural market is based on government interventions, choosing desired branches, and firm structures. According to international experience, this policy direction might in the short-term be able to ensure sustainable value chains. However, for the medium and long term, all stakeholders within the agro-industrial complex must collaborate at all levels, which does not happen in Kazakhstan. Specifically, the policy-makers need to target capacity building of the SMEs to help them to meet the quality standards required by the Corporate Leaders through improvement of their reliability, lead times and efficiency. The policy should also assist stakeholders (especially government agencies) to become more active in building mutual trust to facilitate joint activities. This would enable local stakeholders (especially SMEs) to collaborate and learn, and in the longer run become more competitive.

4 Case studies

This chapter presents the results of the survey conducted in Aktobe region in Kazakhstan. The first case study presents the results of the survey conducted among 69 agricultural enterprises. It studies the farms' accessibility to key production factors, such as capital and fodder, and provides an overview of the production and marketing structure of beef sector in Aktobe region. The second case study is based on 16 interviews with farmers from the largest district in Aktobe region, Kargalinskij district, and the offices from extension department of the DAMU Centre.

4.1 Case study 1

The Agrarian Credit Corporation (ACC) is a subsidiary of KazAgro that provides subsidised credit to farms. It is linked to a network of more than 170 Rural Credit Partnerships (RCP) across the country. The RCPs are local branches of a centralised government subsidy program. The RCPs are groups of 40-50 farms. The leader of each group makes a deposit to be eligible for funding. Based on availability of farm collateral, farmers submit their credit proposal via the RCP to the ACC. If their proposal is accepted, the ACC provides credit at the subsidised rate (4.1% in 2015) to the RCP. Typically, loans offered to farmers are twice the level of the subsidised rate (8.2-8.6%). However, the RCP does not have autonomy in decision-making (Gaisina, 2007). It is restricted to taking savings and controlling the farmers' deposits. Members of the RCP are typically individual farms and enterprises.

The survey found that 17 farmers out of 69 obtained loans in 2015, of which six were provided by KazAgro and four via commercial banks, and the rest of the farmers took loans from private moneylenders. Furthermore, 11 loan-holders were large and medium-size farmers and 6 were householders. The level of debt on the farms' balance sheets is relatively low; 82% of farms have a debt below 6%.

Table 9. Borrowing behavior

	Household s	Individua l Farms	Agric. enterprise s	Agro- holdings

Took loans in 2015	3	3	6	5
Price rationed borrowers	3	2	4	3
Quantity rationed borrowers	0	1	2	2
No new loan in 2015	31	21	1	0
Price rationed no borrowers	29	19	1	0
Quantity rationed no borrowers	1	2	0	0
Risk rationed no borrower	23	16	0	0
Transaction cost rat. no borrowers	26	15	0	0

Source: Author's findings

The findings on borrowing behavior are summarised in Table 2. The price rationing indicator prevails among all four groups, and quantity is gradually increasing from households to agro holdings. The most frequently mentioned motives for not borrowing are price and risk rationing indicators. This group is explained by high fluctuations in agricultural revenues that affect repayment and regular interest rates. Furthermore, from the survey it can be observed that price and risk rationing are the most important indicators for not borrowing among the householders in contrast to agro holdings. Moreover, most of the householders and individual farms do not borrow due to high transaction costs, while for the enterprises and agro holding this is less important.

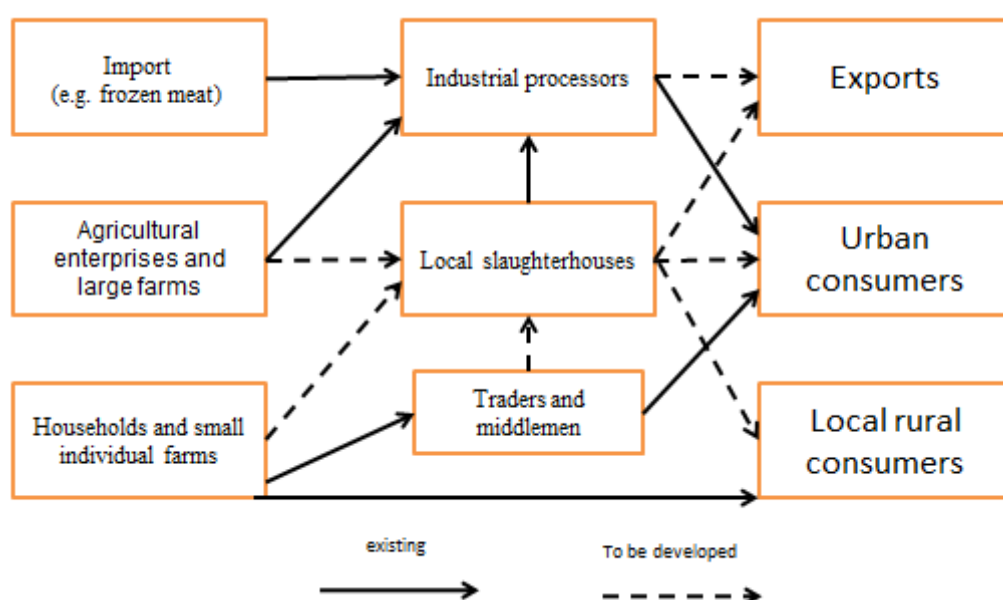
The survey shows that there is a lack of effective demand caused by uncertainty and low returns from farm production mainly among householders and individual farmers. They believe that investments in agriculture cannot deliver sustainable and sufficient revenue that could service repayment rates. Only a small number of respondents think that there is a lack of access to sources of finance that prevents them from borrowing.

The most frequently mentioned reason for inefficient demand is a lack of access to high-value markets for high-quality processed livestock products. The majority of the householders and individual farmers sell meat to local customers, e.g. their own extended families and people in the neighbouring village, alternatively they sell it to traders, e.g. Middlemen, who collect live

cattle around villages and sell them to urban bazaars. The middleman is also responsible for organising slaughter and veterinary certificates. Official slaughterhouses are not typically available in all places, but home slaughter is very widespread through illegal practices. Agricultural enterprises typically have more developed access to high-value markets to sell directly to the livestock processors or export to foreign markets.

The beef value chain in Kazakhstan is subject to a problematic bifurcation, which prevents cooperation between high-value processing and small-scale producers. Figure 16 presents the value chain of beef production in Aktobe region. Small-scale producers of beef mainly supply to local consumers; it is very rare for them to be connected to higher-value markets through semi-professional intermediaries. Industrial processors sell their products to urban customers, and heavily rely on the import of raw material.

Figure 16. Value chain of beef production in Aktobe region



Source: Author's findings

Improvement in the quality of feeding, sanitary and management standards is critical for further development of livestock production. Kazakh meat products cannot be exported to EU countries, neither Russia, because they do not meet the requested standards (EU Commission, 2009). Engagement in beef production requires simultaneous improvements on many fronts, and as most cattle are kept in small scale farming units, the cooperation and coordination among farmers and experts is an important factor for their development. The next section

studies the agricultural extension services in the region and their potential contribution to farmers' innovative development.

Case study 2

After the fall of the Soviet Union, most newly established householders and individual farmers did not have any experience in private farm management (Toleubayev and Jansen, 2010). To address this problem, President N. Nazarbayev emphasised three key areas of agricultural development:

- to increase productivity in the agricultural sector by introducing new technologies;
- to promote export potential;
- to ensure food security throughout the country (Address of the President of the Republic of Kazakhstan N. Nazarbayev to the nation, Astana, January 29, 2010).

To implement the tasks set by the President, the government launched a new agricultural reform. The extension services and the system of agricultural management were revised and many existing agricultural enterprises were privatised. Thus, agricultural production, in particular livestock production, was spread out among private farmers. As a result, the agricultural sector in Kazakhstan experienced a sharp decline of qualified professionals.

In the early 1990s there were about 4,500 agricultural enterprises across the country and after the reform in 2010, there were more than 176 thousand farms. Newly established farms still cannot afford to hire competent specialists to carry out inspections of quality production in their own farms. For this purpose, the government introduced the **sharing knowledge system** (extension services) to the farmers.

The KazAgroInnovation JSC became the responsible body for extension service provisions at the national level. In Aktobe, the extension service is carried out by the DAMU Fund with the aim to promote competitiveness and effectiveness of agricultural production (DAMU Fund, 2014) through educational programs, presentation of new practices in farming, transfer of new knowledge and technologies, and advisory services. Every year the DAMU Fund receives funding from the KazAgroInnovation JSC and the Ministry of Agriculture to organise extension service in Aktobe region, which includes consultations, field visits and seminars. Before every week of seminars, officers send out newsletters to each district and post advertisements in local mass media. Seminar participation is not obligatory. After the enrolment of each course, the farmers receive certificates.

The DAMU Fund officers face difficulties to attract and involve farmers in their activities due to vast geographical distances and the large number of private farms across the region with various interests. That is why the Fund has extended its services geographically and thematically. Also, it started to provide consultation services for agricultural management using online courses and field visits.

The officers believe that building an efficient extension system and involving stakeholders in their activities might take a long time. According to the opinion of a lecturer (a chairman) of the seminar “Brucellosis of cattle”, the seminars provide a platform to develop skills and gain new knowledge and experience, but most importantly a chance to meet new people and develop a network. *“However,” he continued, “a regular member of our seminars is a farmer from the so-called “old Soviet school” that have never visited big cities, and are from very poor districts and background.”*

The officers observed that the farmers rely on traditional methods of farm management. They also mentioned that this group is very passive in general, and especially in terms of adopting new innovations. Due to the fact that most young people moved out from the sector and to bigger cities, the officers mainly work with older people: *“Sometimes I think that our farmers wait for the government to provide all infrastructure to conduct their business, like it was during the Soviet time,”* said one of the officers from the extension centre, referring to the behaviour of the farmers.

The officers provide brochures and certificates at the end of each seminar, but they cannot control further implementation of received knowledge in real life. The officers also report that it usually takes a long time for the farmer to make a decision about adoption of new technologies due to the educational background of the farmers.

There are farmers that expressed positive experiences with the extension department in Aktobe region. At the same time, they are not happy with the economy and government of Kazakhstan in general. There are few successful farmers in the region. Most of them are relatively young people (35-55 years old), and do not have any education in agriculture. Typically, these types of farmers blame the government for price regulation and other obstacles, which arose with the entrance to the Customs Union with Russia.

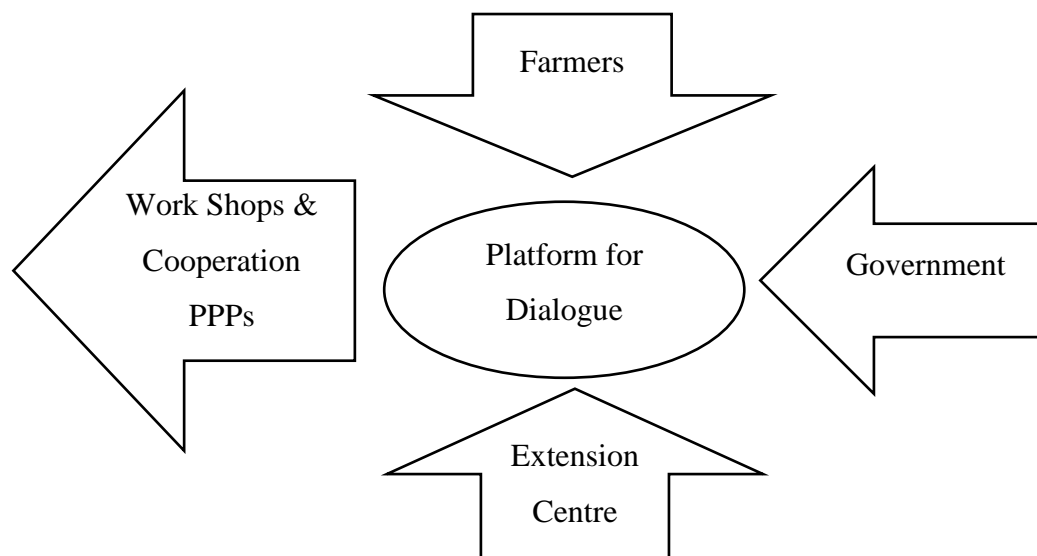
According to the survey, farmers are familiar with the work of the extension department under the DAMU Fund in Aktobe region. Many of them are not satisfied with their work,

saying that their needs are not taken into consideration. Nine surveyed farmers out of 12 are not satisfied with the chosen topics and the way the officers present them at the seminars.

Both parties stated numerous times that the extension services should be conducted by well-qualified professionals who are competent in the field of agriculture and business. In fact, most of the officers at the department have higher education either in economics or agriculture but the truth is that none of them have had any hands-on experience with farm management: *“We need more professionals and researchers that have modern views and the experience to address current agricultural issues in our region”*.

The survey suggests that both parties lack understanding and coordination within their activities. Moreover, the extension services need to approach farmers by arranging a platform for creating a dialogue in order to understand their current needs and difficulties (see Figure 17).

Figure 17. Triple Helix Collaboration for Aktobe region



Source: Author's findings

The two case-studies demonstrate the difficulties related to promotion of the regional innovative system and the innovative capacity of householders and individual farmers in transition countries. It is frequently argued that farmers in Kazakhstan face constraints in terms of access to finance. To address this, the Kazakh government employs subsidised credits to stimulate farm investments. Nonetheless, the survey demonstrated that today the

Kazakh credit market experiences a lack of effective demand determined by the uncertainty of agricultural revenue streams.

According to the government credit program in Kazakhstan, subsidised credits aim to promote competition among the farmers through the upgrade of agricultural equipment, in order to promote more stable and higher returns. Despite low interest rates, the government credit program is not particularly popular among farmers. The survey suggests that the reason behind the low penetration rate of the government credit program among small-scale farmers is the centralised pattern of government operations, and high level of bureaucratic practices, while there is no active involvement of farmers in the decision-making processes. The management capacity of the extension department is also low.

The extension service in Kazakhstan is one of the many examples of imported institutions in Kazakhstan that have not been adapted to the local environment. The DAMU Fund's department of extension services conduct activities using the top-down approach. The officers execute their duties by providing information services to the farmers, while farmers are not interested in the information provided, as it does not address their actual needs. The cooperation between these two groups is also stifled by the economic situation of the country. Most of our respondents express that the government must provide better economic and infrastructure conditions, so that farmers can show their interest to collaborate with the extension department and obtain more knowledge from the internet.

Currently, domestic beef chains suffer from disorganised production structures with fragmented processing procedures and marketing networks, and a weak resource base. There are still unresolved issues related to a year-round fodder supply for farmers of cattle. Most respondents complained about communal grazing land, in particular its overstocking. During the wintertime, the farmers rely on fodder purchases from agricultural enterprises. Artificial insemination is not a typical practice among farmers. The value chain for beef is split into a local chain of raw products that is sold to rural consumers, and an import-dependent chain for industrial processed outputs sold to urban customers. One of the main constraints is the absence of a processing chain and lack of fodder base, which would give rural agricultural outputs access to high-value segments of export channels and urban consumers. Furthermore, efficient local pasture management is a key to the success of beef production.

The Aktobe region case presents some important lessons for rural regions with economic development needs. While it suggests that government mechanisms emerge relatively easily, the institutionalisation and consolidation of the effort is a far more difficult process.

Lessons from the rural regional model in developed countries are highly important, but there is no single model which fits all cases. The level of development and the historical and institutional traditions of individual countries influence the relations among various stakeholders, such as government agencies, farmers, and educational centers.

5 Conclusion

The innovation system approach is popular in developing countries. Nevertheless, literature (Mytelka and Oyelaran-Oyeyinka, 2006; Spielman and Birner, 2008) points to several factors that hinder innovation in the agricultural sector in developing countries, including a lack of sufficient financial sources to conduct radical reforms, changing environmental conditions, and insufficient state reforms. This has encouraged debate on new institutional mechanisms that take into consideration the specifics of developing countries to introduce innovation in the agricultural sector of such countries. Other scholars (Fischer and Hartmann, 2010; Ewing and Msang, 2009) argue that these specific features of developing countries contribute to more intensive development of industrial relations, which boost economic and social progress through appearance of contradictions in society leading to its development. However, a survey of state-of-the-art innovation systems in the agricultural sector of developing countries revealed that caution should be exercised when applying innovation processes of advanced economies to developing countries. Assessing the current trends in innovation processes to agriculture in developing countries requires consideration of both the unique context and the complexities of agricultural innovation in developing countries. An innovation system is a critical, analytical and prescriptive tool for policymaking in developing countries (Douthwaite and Ashby, 2005; Rutten, 2001; Acosta and Douthwaite, 2005). As an analytical tool, an innovative system can help to determine context-specific factors that prevent the creation of innovation systems in developing countries, as well as systemic failures within the systems. As a prescriptive tool, it supports the formation of policies that respond to the needs of developing countries at various stages of their development, e.g. to identify a need to develop or improve activities of intermediary organisations. Hence, the innovation system approach is a widely implemented tool in both developed and developing countries to provide a series of guidelines, e.g. strengthening inter-organisational linkages, capacity-building in public supporting and business sectors, engineering, development etc.

This thesis contributes to addressing this gap between innovative processes in advanced and developing economies by providing an explanatory study that seeks to encourage the innovative capacity of agricultural SMEs through their interaction with government, knowledge institutions and other public agencies. The main contribution of the thesis is the identification of challenges and policy options to promote agricultural innovation systems in

less developed countries, based on case studies of agro-industrial complexes in Kazakhstan. The case studies constitute a possible model for other emerging countries in their efforts to improve the changing role of the government and the greater propensity for public, private and voluntary sectors to interact at multiple scales in diffused power contexts and in efforts to mobilise local actors.

The methodology used in this thesis was conceived with the aim of understanding how to enhance the innovative capacity of agricultural SMEs through improvements in levels of cooperation between the government, knowledge institutions and enterprises in countries with transition economies. The practical part of the thesis was divided into two parts. The analysis of the first part (third chapter) is based on the policy cycle concept, which relies on the evidence-based approach – monitoring and impact assessment to identify priorities and limitations of proposed and adopted innovative policy in Kazakhstan. Besides providing the analysis of the key strategic documents, such as “Kazakhstan 2050”, “Program for the Development of Accelerated Industrial and Innovative Development of Kazakhstan until 2020, and “Program for the Development of the Agro-Industrial Complex in the Republic of Kazakhstan for the years 2013–2020”, I carry out comparative analyses of these documents with the fiscal policies and relevant economic indicators of the country. This approach enabled me to identify a large difference between the formal priorities of national policy as set out in official documents and the actual actions of government agencies in the promotion of the agricultural sector. Furthermore, the institutional environment of Kazakhstan was compared with those of advanced economies to identify institutional voids that become a hindrance to the full and efficient functioning of the instruments for innovation development in the country. This analysis is supported by extensive statistical data published by internationally recognised rating organisations.

The second part of the thesis (fourth chapter) utilises a case study approach to examine the agricultural sector explored at a highly conceptual level. Through this approach, I attempt to capture a socioeconomic, cultural and geographic context that defines the specific organisations and institutions within the innovation system as well as the indicators (second chapter) among the actors.

What is the policy approach and the role of the government in agricultural development?

The main survey findings suggest that the government of Kazakhstan pursues a highly centralised policy approach, based mainly on interventions funded directly from the national budget.

The government shows recognition for private enterprise as a catalyst for “new economic policy” (Strategy 2050), yet it also adopts the lead role by instructing enterprises where to establish and to extend their businesses. The President requires that the government as represented by big national companies enhances the development of the national economy. This includes defining priorities, promoting export growth and entering new markets. It is through this process that the government improves its planning and forecasting systems. The responsibility over this development is assigned to the National Wealth Fund which manages natural resource revenues and directs them to long-term strategic projects.

Despite government recognition of the critical role of entrepreneurs in economic development in strategy documents, the government fails to adequately observe the very notion of the abilities of enterprises to seek out profitable business opportunities. Instead, the government’s approach leans towards the development of the sector through the provision of investment incentives to private businesses; it sets the measured rate of return on investment as the criteria of effectiveness and innovation.

The research evidence suggests that the policy approach towards the development of the agricultural sector falls far short of truly embedded policies for strategic decentralisation of economic governance and the wider public. Moreover, the cooperation and coordination between the government and enterprises is highly incoherent and asymmetric. The strategic documents and overall policy approach give the general impression that the government is keen on achieving quick results. The development of an entrepreneurial and innovative economy is associated with the creation of a favourable, steadily evolving institutional environment.

The second subsection (third chapter) of the research applies the insights gained from the first subsection and illustrates financial and institutional policy support for further sustainable development of the Kazakh beef sectors and examines the effectiveness of official policy responses to address these challenges.

What are the main reasons behind inefficiencies in state support of agricultural SMEs?

One of the main ideas behind the state credit program in Kazakhstan is to promote competition among SMEs through the upgrade of farming equipment that would achieve more stable and higher returns. However, the survey results show that financial support for the agriculture sector is not always popular amongst the farmers. The in-depth analysis reveals that one of the main causes of inefficient demand is the lack of good access to high-value markets for processed high-quality livestock products. The majority of the farmers sell meat to local customers, such as their own extended families or people from neighbouring villages, or they sell it on to traders, such as middlemen who collect live cattle around the villages and sell them to urban bazaars. Moreover, official slaughterhouses are not typically available in all locations and “home slaughter” through illegal practices is very common and widespread.

The beef value chain in Kazakhstan is subject to a major bifurcation that prevents cooperation between high-value processing and small-scale producers. However, the survey does suggest that **the presence of a slaughterhouse could encourage interactions between buyers and sellers that would eventually support the value chain of beef production in Kazakhstan.**

Preceding this, the next subsection (fourth chapter) elaborates on the mechanism for implementing agricultural extension services.

How do extension services support innovation processes in Kazakhstan and what is their contribution to the outcomes from these processes?

Extension services can play a critical role in enhancing the effectiveness of government support towards agricultural SMEs by providing a network or platform for dialogue among various actors within innovation systems at both the regional and national level. Nevertheless, to date the Extension Centres have been unable to demonstrate their full potential in Kazakhstan. Extension services are a new trend in Kazakhstan, a concept imported from advanced economies, which to date have not adapted well to the local context. The survey suggests that for numerous reasons, such as lack of financial support from government and incompetence, the officers seem not to be fully aware of the challenges and opportunities that the farmers face each day. However, the extension service officers could play an important role as intermediaries between the government agencies and farmers by facilitating network development, which would stimulate a collaborative culture among important stakeholders.

From the above crosscutting analysis, several implications for policy and practice can be derived:

- Agricultural development policy goals in developing countries, including Kazakhstan, call for a shift towards demand-driven and pluralistic system approaches that stress cooperation and coordination between various stakeholders in innovation development. To enhance such interaction there is a need to understand the current problems that agricultural SMEs face and try to improve the institutional and infrastructural environment rather than to apply only targeted financial initiatives.
- The role of government is identified in the innovative system of Kazakhstan. It can play an important role in monitoring and coordinating the innovative processes of agri-business, which would entail the provision of reliable and high-quality public services to the sector and make sure that the underdeveloped links in the production chain are identified and strengthened, which usually requires an efficient institutional mechanism at the local level.
- To enhance innovation development in the Kazakh agricultural system, policy needs to pay attention to building adequate innovation capacity in extension centres. It needs to provide support to extension centres, and coaching, funding and mentoring should be at the core of agricultural development projects.

The summary of existing approaches supported the formulation of the following outcomes with implications for developing countries:

- Regional Innovation Systems (RIS) can serve as a tool for studying specific components of innovation in less developed countries. The further advancement of RIS can contribute to the process of reviewing existing problems of agricultural development and consider them as an integral part of social transformation, as well as an enhanced actor-centred approach and a means of improving the quality of life in diverse realities shaped by the specific conditions of less developed countries. Many academic scholars, such as Lucas (1988), Romer (1989), Rutten and Boekema (2012), advocate for the employment and feasibility of the “broader approach”, within which innovation is understood to be rooted in the capabilities and competences of people and activities of enterprises. Furthermore, the narrowly focused analytical approaches

that concentrate solely on science-based activities and subsystems are more applicable in situations with somewhat advanced and established systems of innovation, which is not the case in the majority of less developed countries. To better understand the conceptual framework, the role and sources of knowledge in an innovation system in less developed countries requires deeper consideration.

- Knowledge can be categorised in various types. It may be categorised by form, such as organisational-material or scientific-technical, explicit-codified, or tacit-implicit knowledge. Knowledge can also be embodied in some technology, service or goods, it can be complementary, distinct and disembodied. There is no limitation to the taxonomy of knowledge. However, the Kazakh government seems often unaware of the tacit knowledge it possesses and therefore it is difficult to predict outcomes and impacts upon economic and social processes. Knowledge sources can be derived from the conventional provider of research institutions. Knowledge may also be external to a given agent within an innovation system. Alternatively, the knowledge source may be an internal process. The knowledge can emerge from different practices or behaviours of individuals. Knowledge sources are not only educational or research institutions, but rather entities that discover and introduce new knowledge into a social or economic process.

Further research is recommended as follows:

The scholars emphasise the needs for collaborative partnerships to be made between farmers and formal sector institutions and organisations in agriculture that go beyond a participatory approach to one in which supporting farmers' innovation becomes the impetus for collaboration. This represents a substantial epistemological departure from the neoclassical view of innovation as a linear, input-output model of agricultural development.

This dissertation thesis also provides evidence for how endogenous innovation can coexist with, and be supported by existing institutional arrangements in agricultural innovation. It is foreseeable that the growing recognition of SSFs' adaptive capacity will translate into a wider appreciation for the innovative capacity in coming years. Particularly within the burgeoning field of agroecology, farmers' adaptive capacity in terms of their ability to experiment with new varieties and management practices to suit changing conditions is gathering attention.

There is also evidence of climate change spurring novel partnerships between farmers and formal sector research and development organizations, an example of institutional innovation.

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Appendix A

Questionnaires for case study 1

- What is your current feeding practice of cattle during the winter and summer time?
- Do you have issues with communal grazing?
- What is your main source of hay & silage supply?
- What are your typical marketing channels?
- What are the main factors or obstacles that prevent you from getting in contact with high-value processing and outlets?

Appendix B

1. General Questions

- How long have you been working at the extension services department?
- What is your role in the department?
- Do you cooperate with the government? If yes, how and why?
- How is the government involved in the activities of your department?
- Could you share with me more information about your daily working responsibilities at the department?
- What are the main means of communication with the farmers across the whole of Aktobe region? Are there any problems to approach and engage the farmers in the activities of your department? In your opinion, what are the main reasons for misinformation and miscommunication between your department and farmers?
- Could you describe us the basic characteristics of the typical farmer that you are targeting?
- What internal management factors influence the organisation's performance?

2. Questions related to regional innovative system in Aktobe regions

- Which factors in the organisation's environment influence its performance?
- What are the most promising types of interventions to improve the organisation's performance and its contribution to the regional innovation system?
- Is the evolving nature of the agricultural sector placing new demands on the organisation?
- What is the role of the organisation within the innovation system? Is this role still relevant?
- How may it need to change?
- Are the organisation's patterns of partnership and collaboration sufficient to maintain its relevance in the evolving agricultural sector? What new linkages might be

required?

- What learning-based mechanisms for enhancing organisational performance are in place?
- How can the organisation's contribution to the overall innovation system be improved?

Appendix C: Questionnaire for Farmers

General Questions

1. Introduction of research background and myself.
2. Could you please introduce yourself and activities and type of the farm you have?
What do you cultivate and how big is your farm?
3. How much time do you invest in farming a day?
4. Which farming inputs and methods are you using currently?
5. What daily problems do you face regarding farming?
6. Is farming your sole source of income? If not, what else? Why not?

Innovation

7. Are you familiar with new or different farming inputs or methods? Would you be interested in applying new or different inputs or methods?
8. Do you have innovative ideas that you would like to realise? What are they and when did you start with them?
9. Do you have any experience with implementation of innovations? What was the target?
10. Did you experience supporting or constraining policies regarding innovations? If yes, what were they? How did they support or constrain your activities?

Extension services in Aktobe region

11. Have you ever been in contact with the Extension Department of DAMU? How often do you approach this department? Do they contact you?
12. Do you participate at organised workshops by the extension department? Why? What motivates you?
13. Could you provide me with some example of how you got the advisory services from the Extension Department? How would you evaluate the services they provide?
14. What would you require from extension services?

15. Do you have any suggestions for other persons to interview?

Appendix D: SWOT analysis of agricultural sector in Kazakhstan

<p>Strong</p> <ul style="list-style-type: none"> -The constant growth of the gross product of AIC; -Kazakhstan is the world leader in the production of wheat and wheat flour; -AIC of Kazakhstan receives significant government support; -Provision of land and water resources; -The high potential of production and export of organic products. 	<p>Weak sides</p> <ul style="list-style-type: none"> - Small-scale production in a number of sectors; - Low labor productivity; - Low productivity of animals; - Low yields of major crops crop; - Low embeddable R & D; - Low degree of spread modern agro technological knowledge; - Undeveloped system financing and insurance.
<p>Opportunities</p> <ul style="list-style-type: none"> - The development of import substitution and export capacity in the implementation of some agribusiness industries; - Building an effective state support for the industry; - Development of commercial fish farming, export of cattle meat, transhumance, apple production, oil and other products. 	<p>Threats and risks</p> <ul style="list-style-type: none"> - Macroeconomic risks associated with the deterioration of the domestic and external conjuncture of world prices for the products of the industry; - Increasing competition in international markets, in connection with the entry into the WTO; - Adverse changes in climatic conditions, both short-term and long-term (global warming and the associated increase in arid and semi-arid lands, growing water scarcity, instability, weather conditions, etc.); - Critical infrastructure wear and tear on the transport of products to the target markets and the consequent rise in the cost of delivery;

	<ul style="list-style-type: none"> - The spread of diseases of plants and animals and environmental pollution, the parasitic species of plants, animals, fish, insects that cause a decrease in the availability of land, water and other resources and a reduction in overall industry productivity could reduce the export potential of Kazakhstan AIC; - Low level of profitability of businesses; - Depletion of land potential, water, biological resources, genetic potential of the animals, 34 plants and fish as a result of short-term focus on profits, deficit finance, non-compliance with scientific standards recommended the use of resources; - Risk of inefficient state regulation of the industry, which could cause an increase in transaction costs of agricultural producers, the inefficient use of public funds allocated to support the development of the industry, the distortion of market signals and distortions in the structure of production and processing of products.
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Source: “Agribusiness 2020”, Author’s translation

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Abstract

The thesis explores and defines the Quadruple and Quintuple Helix models and regional learning concepts for developing countries, with focus on the role of government, knowledge institutions and farmers as key actors in supporting innovation processes, using case studies from the Kazakh agricultural sector. It contributes to the debate on how to boost the innovation process to advance sustainable smallholder agricultural development. The case studies are based on farm-level data covering the most relevant production and knowledge systems of five rural districts of Aktobe region. The analysis provides an assessment of state agricultural development strategy and reveals the lack of reliability in investment returns owing mainly to undeveloped fodder supply and inefficient value chains, which deters the taking of loans. In light of endogenous economic growth understanding of the role of the state in promoting sustainable development, as a policy option alternative the survey suggests a focus on the development of a stable institutional framework for the broader economy to stimulate knowledge production processes. However, widespread conflicts among informal institutions delay both the short and medium-term results from state reform.