1 Introduction

1.1 Background

*Gai ge kai fang* which means “change the system, [and] open the door” (Dollar, 2007, p.4) [author’s addition] is the reform program of China’s economic system. Following this goal China opened its economy and got stronger involved in world wide economic exchange. Parallel to these globally oriented reforms the internal policy agenda shifted the attention from a promotion of secondary industries and urban areas to the rural areas, which had received less attention in terms of the development of welfare and infrastructure during the 1960s and 1970s. What happened since the mid 1980s in rural areas of China? Aspects of this question will be answered with the help of a case study on the development of rural areas and respective institutions in times of societal transition and structural changes in agriculture in the Hebei province.

Structural and institutional changes in the agricultural sector are a common pattern found during the development of economic systems from subsistence agriculture to a more diversified economic system (Kirschke et al., 2007). During the structural transformation of an economy the share of the agricultural sector declines and it is expected that the sector provides capital (including land and labor) to other sectors, which allows expanding the activities of the secondary and tertiary sector (Johnston and Mellor, 1961).

Recent research revealed that land renting institutions are differing quite strongly among different regions in the North China Plain and that land rental markets are not completely developed and by this cannot fully fulfill their economic function of allocating land to its most productive uses (Piotrowski, 2009). With respect to credit institutions not only are households found to be constrained in formal credit markets but also substitutability between formal and informal credits appears to be limited in rural China (Jia, 2008).

The term institution in general refers to all measures that are related to organizational processes in all sectors of an economy, to the modes of use rights and resource allocation, social and political norms, but also to other societal and system related mechanisms that could have an impact on individual behavior (Krug, 1990) and the enforcement mechanism behind those measures (North, 1994). In theory, this means that formal and informal institutions are an omnipresent framework that is – purposively or unintentionally – implemented by humans and that determines all human interaction (North, 1990). In the present study more specific institutions such as local measures of land allocation and
land renting, implicit or explicit restrictions to migration as well as the role of land for social security (see e.g. Li et al., 2007) and the production of food for subsistence are assessed. As indicated by North (1990), an important role of institutions is to reduce uncertainty and by this the provision of a stable framework that helps individuals or societal agents to organize their interactions. If the efficiency concept of North (1990) is applied then a situation can be called efficient if it leads to economic growth under a set of constraints. Even if institutions should be designed to reduce those constraints, such as transactions costs, it will never be possible to eliminate all constraints. There will be always some constraints like institutions which are constraints in themselves, alongside with economic constraints like technology, budget and time constraints. Or as North (1990) also states, since there is always some degree of uncertainty, e.g. about future development regarding prices or labor demand, it is just not possible to reduce transaction costs to zero and by this to reach the theoretically possible maximization of objectives that might be profits or investments in human capital. When positive transaction costs are included in theoretical models to assess economic transition then the inter-temporal resource allocation is influenced by the role of the state (Buchenrieder, 2001). In such a situation of non-zero transaction costs, the institutions designed by policy to assign property rights do not necessarily follow the argument of Coase (1960). He states that the initial assignment of property rights (e.g. when privatizing former state companies) does not matter in the case of zero transaction costs and freely transferable property rights, since the transactions between market agents will always lead to a distribution of rights that increases the value of production.

Nonetheless, institutions are, beside their stabilizing character, themselves subject to changes during periods of transition (Buchenrieder, 2001). Especially because large societies are facing complex adjustment processes North (1990) favors the adaptive efficiency approach. According to him, adaptive efficiency is linked to the assessment of the kind of regulating structures that have an effect on the pathway of the development of economies over time. As one consequence of adaptive efficiency North (1990) argues for decentralized processes of decision-making which he judges as being appropriate to enable societies to maximize their attempts to find alternative ways of solving problems. In Hebei it can be observed that the organization of formal institutions differs from county to county or even from village to village (Böber, 2008 and 2009). Following the argumentation about decentralized decision making, this could be considered as being efficient to set up institutions that support local economic development by providing growth despite existing constraints. Adger (2000) discusses the necessity of institutions to be resilient and adaptable. To a large extent the resilience of institutions depends on their exclusivity and on the degree of trust that the
society has in them. That is important to be kept in mind when evaluating farmers’ attitudes towards the formal institutions to which they are liable to. Social resilience is defined by Adger (2000) “...as the ability of communities to withstand external shocks to their social infrastructure.” (p. 361). Farmers in Hebei are subject to natural shocks that affect the output of production directly such as floods or droughts but they are also faced with policy or administratively induced shocks such as unscheduled redistributions of land rights.

It is not always possible to identify direct effects of an institutional change. Especially for the micro-economic analyses, based on a data set that is limited to the household level, quite often changes in price systems or policies can hardly be included directly but need to be approximated instead. Also changes in non-market institutions such as attitudes or habits that occur rather slowly (Kuiper, 2005) are difficult to cover with the models and available data. However, it is worthy to be aware of potential impacts of institutional changes because they might serve as a key for the interpretation of results that will be presented and discussed later in this document.

Regarding the goals of Chinese policy self sufficiency in food production is one major aim (Fang and Beghin, 2000; Solot, 2006). To achieve this, agricultural production systems are needed that allow for the effective use of scarce natural resources and for more participation of the rural population in production decisions and adequate incentives for individual farmers to increase production (Lin, 1997). In the end of the 1970s some production teams started a system where land, other resources and output quotas have been contracted to individual farm households, the household responsibility system (Sachs and Woo, 1997). Since the nation wide introduction of the HRS in 1981, agricultural production in China experienced massive changes in productivity (Davis, 2002; Sanders, 2000) and the rural areas developed rapidly. But Fan (2007) argues that the productivity of labor is still the lowest in agricultural production compared to the industry and the service sector.

Another policy aim is to reduce the rural labor surplus to overcome the problems of rural poverty and low income of farm households (Tuan et al., 2000). Lohmar (1999) mentions that there is an ongoing debate to how far the institutional changes in the rural labor market are considered as being successful. One group of scholars argues that there is a higher increase in opportunities for rural laborers to supply labor off the farm since the end of the 1970s in China than in countries with comparable rural (labor) markets. But Lohmar (1999) also

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1 China is feeding around 1/5 of the world’s population but only having access to around 8% of the worldwide available arable land (own calculation based on data for 2008 available at FAOSTAT, FAO, 2010).
lists the arguments of other scientists who consider the relatively large share of human labor in the mix of agricultural production inputs, in comparison to other countries with a similar level of economic development, and the high and increasing inequality between agricultural and non-agricultural household income as facts that indicate imperfections in the labor market. Zhen and Zoebisch (2006, p. 62) emphasize, that the gap in income equality between (rural) households should not be “too great”.

The transition of rural China and the agricultural sector was not free of costs. Chinese policy makers are challenged by keeping a balance between industrialization (also of rural areas), urbanization, and self-sufficiency in food production (Zhang et al., 2004). Beside the increase in absolute well-being of the rural population in comparison with the period before the transition from a fully state planned economy the distribution of welfare became more unequal. Not only are the coastal areas outperforming the inner provinces of China in terms of income and infrastructure development but especially the gap between the rural and urban population has been widening since the start of the (agricultural) reforms in the end of the 1970’s. By the household registration or hukou system individuals are categorized in two classes of citizenship, rural and urban. Rural residents are excluded from a wide range of benefits provided to the urban population such as public transport, urban schooling or urban health care and they are not allowed to take up every kind of work in urban areas. Just jobs that are considered as dangerous or dirty and offer low payments are accessible for rural laborers in cities without constraints (Chan and Buckingham, 2008). Rural-urban migration was and is hindered by the household registration system and by this also fueled the emergence of a wide gap in income and welfare between urban and rural areas (Dollar, 2007). But well-functioning labor markets are considered to be a pre-condition for facilitating the successful modernization of the Chinese economy (de Brauw et al., 2002).

Also in Hebei province the rural economy and society and the related institutions underwent structural changes. As can be seen from Figure 1 the share of the rural labor force working in agricultural production declined relative to the other sectors. But also the absolute number of rural labor employed in agricultural production decreased in Hebei. The information for 1978 is provided to have an overview about the composition of the rural labor force at the start of the reform period. For the years 1992-1994 no data are available for Hebei.

Hebei as one major area of grain production is of great importance to achieve high and constant levels of food production. According to Hu (1997), apart from rice, wheat, maize, sorghum, millet and other miscellaneous grains, in China grains also include potatoes, sweet potatoes, soybeans and beans (Hu,
The quota was applied to all of these so-called grain crops. As such Hebei is the agricultural backbone of the urban areas of Beijing and Tianjin. Due to a high population density Hebei itself is faced with pressures on the rural society stemming from land fragmentation and surplus of agricultural labor (Bhattacharyya and Parker, 1999).

Moreover, input levels for mineral fertilizer in Hebei province are high and environmentally unsustainable (Zhao et al., 2006). The current migration policy does not allow rural residents to permanently exit agriculture and rural areas. Motives to establish or to stabilize part-time farming like e.g. positive external effects of German small holder farms on the landscape or in Norway and other developed countries to prevent farmers to migrate from the rural areas do not seem to be the first priority on the policy agenda in China.

The research for this thesis was conducted in the framework of Subproject 3.3: “Property Rights and Access to Credit, Inputs and Agricultural Knowledge:

According to Hu (1997) special conversion rates help translating quantities of tuber crops into an equivalent of 1 kg of grain.
Implications for Technical Efficiency, Sectoral Change, and Rural Income Inequality”, which is part of the International Research Training Group (IRTG): “Modeling Material Flows and Production Systems for Sustainable Resource Use in Intensified Crop Production in the North China Plain”, supported by the German Research Foundation (DFG) and the Ministry of Education (MoE) of the People’s Republic of China. In Appendix A, a structural outline of the whole research project is given (Figure 12).

1.2 Objectives

Farm sizes in China remained stagnant since the start of the reforms in the agricultural sector, and inequality in income and well-being did not only increase between urban and rural areas but also within rural areas (Benjamin et al., 2007; Lin and Ho, 2003; Wan and Zhou, 2005, Yu et al., 2007). But Rozelle (1994) reviews studies which found falling levels of inequality in rural China after the start of the reforms. Rural non-farm income is not only seen as an important contribution to household food security but also might act as an inhibitor of urbanization, because migration is of less importance if households are able to diversify income at their rural location of residence. In addition non-farm income is also one measure to prevent natural resource degradation that could occur from overexploitation because of non-sustainable agricultural production systems when people depend solely on agricultural income (Reardon et al., 1998). A rising share of farms in China is managed by older people (Pang et al., 2004), and many rural laborers work only part time on the farms (Carter et al., 1999).

This increase in off-farm activities affects inequality among the rural population whereby different income sources contribute differently to overall income inequality of rural households (de Janvry et al., 2005). But it is also found that those households that continue farming as full-time farmers and by this specialize in agricultural production have characteristics that make them more productive than those households that leave the sector partly or fully (de Janvry et al., 2005).

Social welfare is a topic of rising interest in socio-economic research in China and different approaches are discussed from different perspectives with respect to either the function of rural social security nets, the development of the rural economy and infrastructure and the role played by family and relationship

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Rural non-farm income is defined by Reardon et al. (1998) as all income earned by wage paid activities in agricultural production, industries and services. Farm wages and migratory income are excluded by this definition.
structures (Hebel, 2004). The transition from a state planned to a market economy can be considered as an economic shock that affects the well-being of population subgroups differently (Araar and Duclos, 2006). During the 1970s and 1980s income inequality decreased but welfare inequality increased. Social policy measures with respect to the provision of education and health care and the maintenance of income favored urban over rural areas (Davis, 1989). Also Fan (2007) emphasizes the growing disparity between urban and rural regions. In 2002 the urban per capita income in Northeast and East China was around three times higher than the rural per capita income.

As recent research has emphasized it is important to assess the development of inequality among the rural population in China (Benjamin and Brandt, 1999; Benjamin et al., 2005), poverty (Benjamin et al., 2007; Duclos et al., 2008), the interaction between geographical diversity, poverty trends (Chen and Ravallion, 2004) and farm households’ labor allocation decisions (Wang, 2007; Glauben et al., 2008). To the best knowledge of the author it is the first time that this assessment is done for Hebei province based on a comprehensive longitudinal data set. In addition this work provides an understanding of the determinants of Chinese rural households’ labor allocation decisions which helps in the assessment of applied and intended policy measures that focus on rural development.

Poor people in rural China are not only affected by inequality in income but also they are less well equipped with the provision of education and health care (Zhu and Jiang, 1995). Also Dollar (2007) shows, there has been increasing inequality regarding education and health care provision in China. Because the data set, as described later, only contains household level data and no regional or census information, the focus of the present assessment of inequality will be on income and on expenditure based poverty measures. Yu et al. (2007) review several studies on inequality in rural China and figure out that the studies differ with respect to the chosen inequality indicators and/or the time span assessed. But in general inequality is found to be more related to regional differences (costal vs. western provinces or urban vs. rural areas) than to differences among households in a specific location.

Benjamin et al. (2005) find in their Shorrocks decomposition of rural households’ incomes from nine Chinese provinces that self employment income from non-agricultural occupations and the relatively slow growth of agricultural income after 1995 led to an increase in income inequality in rural areas.

The assessment of the sustainability of agricultural production systems in the North China Plain is one of the overall aims of the IRTG project. Sustainability is often defined as a concept made up of “three pillars”, where attention is equally paid to the economic, environmental and social dimensions of decision-making (Pope et al., 2004), which are also referred to as the normative dimen-
sions of sustainability (Zhen and Routray, 2003). A sustainable agricultural pro-
duction system is also based on the time and space-specific dimension of sus-
tainability (Zhen and Routray, 2003). While the net farm income or the crop productivity are examples for economic indicators of sustainability, inequality in poverty and in income are social indicators (Zhen and Routray, 2003). The latter ones are used in this study for the assessment of the social dimension of agricul-
tural sustainability in rural Hebei. They reflect both; the spatial aspect of sus-
tainability, here with respect to different households in one region (province), but also the time dimension of this concept, with inequality indicators containing information about short-term but also about long-term aspects of sustainable de-
development.

The first objective of this study is to assess determinants that influence in-
come generation and the well-being of rural households in Hebei. Research
questions related to this aim are:

- How did income and poverty develop over time?
- What changes occurred in the composition of income?
- Which role does the fragmentation of the agricultural sector (small farm size and low degree of specialization) play with respect to household’s well-
being?
- How do different on- and off-farm income sources affect income inequality?
- Which determinants are relevant for household’s labor market participation?

The agricultural sector in the research area is still dominated by high-input,
low-output (per farm and arable land area) part-time smallholder agriculture (Pi-
rotrowski, 2009). Following the argumentation of increasing economies of scale, larger, more commercially oriented full-time, farms should be more efficient. On the other side part-time farming in combination with off-farm wage labor activities is seen as a strategy to diversify income based on different perceptions of risk by part-time and full-time farmers (Lien et al., 2006). Wan and Cheng (2001) and Chen et al. (2003) found in their studies on Chinese farms negative economies of scale.

Research in other countries showed that farm exit rates are strongly influ-
enced by family, farm and regional characteristics (e.g. for Germany see Glau-
ben et al., 2006; for Israel see Kimhi, 2000; and Ahituv and Kimhi, 2006). In
China there are no studies accessible in English which investigate questions re-
lated to the succession of family farms and the changes in farm size structure. The formal reason is that land is not allowed to be passed on to a member of the household if the holder of the land use right dies. But instead the land use right goes back to the village pool of responsibility land and will then be reallocated.
In addition most of the households in rural China are considered agricultural households (Zhu, 1991; and Glauben et al., 2008). By this they represent a production unit that is referred to in this work as farm. Also there is no general decision mechanism about the succession of a farm like in other countries because the household holds only use rights of the agricultural land that was distributed by the village usually based on per capita measures. The village, in other words the state, collectively owns the land (Gale et al., 2005). Differences in the amount of land per household are related to differences in the demographic composition of the farm family but are at the same time also based on administrative land allocation schemes. This is different to the finding of Tschajanow that differences in land holdings can be explained by differences in the reproduction patterns of peasant families (Bernstein and Byres, 2001).

Generally, agricultural income is just one of the various income sources of farm households in developing countries (Schwarze and Zeller, 2005). Due to structural changes in the Chinese economy and the development of the secondary and tertiary sector, a lot of possibilities evolved for the rural population to supply labor also to other activities than to family based agricultural production. So it is worth to analyze the evolution of labor supply decisions of farm households in rural Hebei. The provision of off-farm labor can reduce the surplus of rural labor (Feng and Heerink, 2008) that otherwise cannot be fully employed in agricultural production. The development of job opportunities outside the agricultural sector already reduced the labor surplus in rural areas of China to some extent (de Janvry et al., 2005). Despite the fast growth in China’s non-agricultural sectors the reallocation of labor out of agricultural production was rather low during the past decades of transition due to restrictions in labor mobility (WDR, 2008). The assessment of individual, location and institutional factors that have an impact on households’ decisions to participate in the agricultural and non-agricultural labor market could help to understand this low rate of labor reallocation.

A large share of farm households in Hebei derive income from non-agricultural sources. The question then is, why they continue farming as part-time farmers and do not specialize into being either full-time farm households or by giving up agricultural production and being households of employed workers or running an own business? Often it is argued by scientists that discuss the assignment of land use rights in China, that rural households keep their land use rights as a means of social security even if they would not really need to farm the land anymore since the household income is earned outside the agricultural sector or is send home as remittances by migrant workers (e.g. Zhao and Wen, 1999). But Phimister and Roberts (2006) show, that part-time farm household are less efficient in their use of inputs, if one discusses efficiency as the “sur-
plus” after deducting input costs from the output (Sen, 1962). Those part-time farm household apply relatively more chemical fertilizer than larger commercially oriented farms. One explanation could be that part-time farm households have lower capital costs for investments in farm production, since they use cash from income earning activities outside the agricultural sector. As another explanation those part-time households might have lower labor costs, at least for those household members (e.g. teenagers or elderly) that don’t have sufficient skills which would allow them to participate in off-farm occupations. The results of Barning (2007), Jia (2008) and Piotrowski (2009) seem to indicate, that economies of scale, scope and risk are not fully exploited in the intensive agricultural production systems of Hebei. But other authors provide evidence that farms in China not necessarily have to be large to be considered as being efficient (Wan and Cheng, 2001; Chen et al., 2003). In the section that focuses on the separation of household labor supply and demand (chapter 1.3) an explanation of Sen (1962) is discussed that indicates the potential pitfalls if one uses market based wage rates to include the costs of family labor into the assessment of farm efficiency.

The distinction between part- and full-time households has important implications not only for the income generation of the assessed households but also for the levels of chemical inputs applied, and by this also for the assessment of the environmental pillar of the sustainability of the agricultural production systems in Hebei. An assessment of the impact of intensive input use in agricultural production and farmers’ awareness about the relationships between agricultural production and the degradation of environmental resources for Hebei province is provided in Böber and Zeller (2009). So, the second objective of this thesis is to analyze the determinants of change in the number and types of farm households over time. Related questions to this part of the work are:

- Which farm types exist in Hebei province with respect to the distinction between part-time and full-time farming?
- What determines the size of the farm?
- How does the sectoral diversification of labor time influence farm types and structure?

In the next part of this work hypotheses which relate to the two research objectives are presented.
1.3 Hypotheses

Based on the review of theoretical literature and of empirical studies the following hypotheses are formulated and assessed in the empirical part of this work.

Poverty

Chen and Ravallion (2004) state, that between different geographic regions China’s WTO accession had diverse effects on poverty development. They simulate the gains and losses associated with the WTO accession for rural and urban areas in three Chinese Provinces. Even if the WTO accession is found to have only a slight positive impact on poverty, Chen and Ravallion (2004) indicate that rural households mainly involved in agricultural production might loose most from integrating China into world trade. This is especially true for assessments that focus at the short-run effects of the WTO accession, since rural wages are expected to fall while the prices for consumption goods are expected to increase. The well-being of farm households in China can be affected by different price and income effects. If wholesale prices for agricultural products drop, the income of farm households is reduced, but farm households might also cash in on a drop of consumer prices and higher wages for off-farm labor (Chen and Ravallion, 2004). However, the study by Chen and Ravallion (2004) did not take into account possible specialization of Chinese farms into high-value, labor-intensive crops. In contrast, Hertel et al. (2004) assess possible welfare effects of the WTO accession in the long-run and argue that also poor and specialized agricultural households might gain from increasing labor mobility between the different economic sectors.

The structural changes in rural China contributed largely to the alleviation of poverty (Swinnen and Rozelle, 2006). The growth of the agricultural GDP is considered to be mainly responsible for China’s success in poverty reduction because it is estimated that it contributed around 3.5 times more to poverty alleviation than the growth of industry and services (WDR, 2008). This is mainly because China comes from being a country dominated by rural population, which also makes up the largest share of the total poor population. But it is shown in previous studies that absolute poverty in China did not decrease in every year. Especially in the years 1987 to 1990, where some reforms have been stopped or reversed, poverty increased (Dollar, 2007). Since the beginning of the reforms in the 1970s the reduction of absolute poverty was the main aim of policy makers (Hussain, 2004).

In addition to the distinction between absolute and relative poverty, poverty can also be decomposed into a transient component, which indicates the inter-
temporal variability in peoples’ consumption, welfare or ill-fare status, and into the component that represents the proportion of poverty that persist over time; chronic poverty (Jalan and Ravallion, 1998). The distinction between these poverty components is of relevance for applying respective policy measure for poverty alleviation. As Jalan and Ravallion (1998) explain, chronic poverty might be reduced by investments in human capital or physical assets whereas a reduction of transient poverty could be reached for instance by stabilizing income-streams of rural households. An example for such a stabilization are cropping insurances that partly cover losses incurred due to bad harvests.

It is hypothesized that absolute poverty in rural Hebei declined during the period 1986 to 2002, even if there might have been years in which absolute poverty increased and that the larger share of absolute poverty in 2002 can be classified as chronic poverty. This hypothesis will be assessed in chapter 6.1. In addition, location and household related characteristics (e.g. the educational level attained by the household head) are used in this part of the work to assess determinants of poverty elasticity and inequality in the poverty elasticity among different population groups. The elasticity of poverty with respect to growth is used as one tool to measure to how far economic growth reduces poverty (Son and Kakwani, 2004).

Separation of household labor demand and supply

The assumptions regarding existing and functioning markets are critical to the formulation of an agricultural household model (Benjamin, 1992). Benjamin (1992) focuses in his discussion of agricultural household decisions on the separation between labor demand and supply. Tschajanow (1923) finds evidence that large households employ relatively more labor per given amount of land than households which have less members and hence a lower endowment with family labor. This is seen as an indicator of labor market constraints that hinder the household to supply labor outside the own family farm. Sen (1962) discusses the appropriateness of applying wage rates to value the amount of family labor input when assessing the productivity of small scale farms. He describes the inverse relationship between farm size and human labor used as input in agricultural production. While the amount of employed labor is decreasing the smaller the farm size gets, the amount of family labor used as production input is increasing, to an extend that in total more human labor is employed per unit of land. In addition, Sen (1962) describes that in many cases small farms are found to achieve a higher output per given area of land. This would seem intuitive, if one assumes farming at the small scale as being more productive. Sen (1962) does not see the size of the farm as the determining factor of the efficiency of the agricultural
production but he argues that the production system itself is more relevant for the explanation of farm productivity. If most of the human labor input in small-scale farms consists of non-wage family labor and one uses a market wage to value this labor in terms of production costs, it is often found that the production costs are higher than the (monetary value of the) output of small farms. The conclusion of Sen (1962) is that one has to be careful with using a market wage rate as an indicator for the production costs of family labor, since this wage rate does not necessarily represent the marginal social opportunity costs of labor, especially in situations where no alternative uses for family labor outside the own agricultural production exist.

Benjamin (1992) considers the separation property as ideal to recognize that farmers can be characterized as being workers and capitalists at the same time. He assumes that the optimum (profit maximizing) allocation of farm labor does not depend on household preferences or the amount of land farmed, but only on the available production technology and on the wage rate for labor. Every combination of family and hired labor is possible if separation holds. As indicated by Benjamin (1992), in the context of separability of consumption and production decisions of farm households the supply of household labor is considered in the household utility maximization problem as a consumption decision, based on e.g. consumption preferences of household members and the demographic composition of the household(s’ labor force). And the demand for labor is considered as production decision that involves the decision about the desired level of production, the choice between different activities and the input use decision (de Janvry and Sadoulet, 2003). In general, microeconomic household models reflect the trade-off between time and consumption of goods, where leisure is one, by a time constraint. This constraint states that time can be converted into goods if less of it is used for enjoying leisure but more time is devoted to work (see e.g. Becker, 1965).

If separability holds for an agricultural household model, then the amount of family labor that is employed in own agricultural production of the household should not be determined by the amount of laborers or the composition of the household’s labor force, e.g. whether there are male or female laborers available in the household (Benjamin, 1992). Or as Arcand and d’Hombres (2006) explain, if separability holds than only plot characteristics, the applied production technology and prices are the determinants of the marginal productivity of all farm inputs. Therefore in chapter 7.1.1 structural variables will be explained that are suited for the assessment of separability between households’ labor demand and supply decisions.

In the case of separability of rural households’ decision about labor demand and labor supply, the household would act as profit maximizer and would allo-
cate production factors separately from its own factor endowment (Kuiper, 2005) as well as consumption and leisure preferences (de Janvry and Sadoulet, 2003). Thus, the household would choose an allocation of family labor time that maximizes the households’ overall utility (Hanf, 1996). In its’ decisions about allocation of family labor time, the household would consider the marginal utilities of all possible uses of family labor time.

A well functioning labor market could help in determining the marginal utility of household labor supplied to off-farm occupations and in identifying the marginal costs if non-family labor has to be employed at the family farm (Hanf, 1996). Despite the existence of labor markets still difficulties could arise for the household if it wants to make long term labor allocation decisions: there is instability in off-farm labor demand and uncertainty about the future development of off-farm income for unskilled and skilled laborers (Coutu, 1957).

Coutu (1957) argues in his assessment of part-time farm decisions in the U.S. in the 1950s that some part-time farm households seem to value leisure higher than the marginal product of family labor time allocated to agriculture. He considers the limited knowledge of part-time farm households about agricultural production possibilities as the reason for this finding. The shadow wage of family labor could be distorted downwards due to the social security function of family labor (young laborers taking care of retired household members) in inter-generational contexts (Rosenzweig and Wolpin, 1985). In the context of the present study, labor surplus in rural areas in Hebei could lead to distortions in the valuation of leisure and farm labor time.

As Benjamin (1992) argues, assumptions about separability are made quite often but models that test for specific reasons of the existence of non-separability, e.g. constraints in rural farm and non-farm labor markets are not often applied.

Bowlus and Sicular (2003) explicitly assess separability in the context of farm household labor allocation decisions based on panel-data for the years 1990 to 1993 for Shandong province. They reject separability between households’ labor demand and supply and conclude that even more than one decade after the reforms of the agricultural sector started, the labor market is strongly constrained and does not allow for an efficient allocation of rural labor.

Based on the theoretical discussions of Benjamin (1992) and the results of Carter and Yao (2002), Bowlus and Sicular (2003) and Kuiper (2005), it is hypothesized that labor demand and supply decisions of farm households in Hebei are non-separable.

It is necessary to test this hypothesis because non-separability would not allow solving agricultural household models recursively. The labor demand would depend on the composition of household labor and the labor supply would be
dependend on the household endowment with the fixed production factors land and capital (Yotopoulus and Lau, 1974). If non-separability is found, then profits cannot be maximized independently of the utility function during utility maximization (Benjamin, 1992). Lopez (1984) also assesses the interdependence of profit and utility maximization of agricultural households and emphasizes that the agricultural household models have to account for the differences in cases of interdependence or non-interdependence of utility and profit maximization. In addition, the recursivity between agricultural households’ labor demand and supply decisions is one major aspect where the respective agricultural household models differ from the assumptions and considerations that led to the development of household models that are applied to assess the labor allocation of workers’ households in developed or industrialized countries. In chapter 4.2.2 the model to test for the hypothesis of non-separability is presented and in chapter 7.1 the hypothesis will be assessed.

**Labor market participation**

Education is a main explanatory variable with respect to individuals’ and households’ labor market participation decisions. It increases the productivity of farm and off-farm labor and leads to reductions in transaction costs (Glauben et al., 2008). Ahituv and Kimhi (2006) consider human capital as being more productive in off-farm employment. Higher levels of education achieved are associated with higher earnings (de Janvry and Sadoulet, 2001). Tuan et al. (2000) indicate in their study on Chinese census data that skills necessary for non-farm activities are mainly developed at the secondary or high school level. A decrease in the probability to participate in agricultural production with increasing education is also found by Babatunde and Qaim (2009) for farm households in Nigeria. They argue that households which have access to sectors with higher wages than in agriculture follow a pattern of demand-pull diversification of labor supply.

It is hypothesized that better education of the household head and specific training provided to individual household members have a positive effect on the participation of the household in the non-farm labor market.

Whether this hypothesis holds is assessed in chapter 7.2.

**Farm structure persistence**

The literature about labor allocation decisions of individual farmers or farm households discusses two main aspects with respect to labor market states. Some authors provide evidence for structural state or inter temporal dependence of labor supply decisions (Weiss, 1997; see also the discussion in Brosig et al., 2009). True structural state dependence is found if the previous state, in which
the observation unit (here household) was, changes the constraints and parameters the household faces in the recent state or if the attitudes of household members are changed by the previous state the household belonged to (Corsi and Findeis, 2000). If there is structural state dependence then policies that affect farmers’ labor market participation decisions at one point in time would have an impact on the outcome of future decisions of farmers to participate in the labor market (Ahituv and Kimhi, 2001). Other authors argue that it is also important to discuss impacts of the amount of time that a person remained in a specific labor market state on the probability that he or she might leave the state at a specific point in time (Chan and Stevens, 2001; Knight and Yueh, 2004).

Following Brosig et al. (2009) it is of interest to assess the choice of farm households of either exclusively engaging in own farm production or of supplying labor off-farm as well. By this an insight in the persistence of part- and full-time farms in rural Hebei is gained.

It is hypothesized that the time that a household operated as either part- or full-time farm household decreases the probability that the household will change the state.

For this hypothesis the assessment is presented in chapter 7.3.

1.4 Outline of the thesis

Chapter 2 shortly introduces the Hebei province and the socio-economic and environmental conditions framing the development of agricultural production and the involvement of the rural population in agricultural and non-agricultural labor supply. This also builds the basis for understanding why the size of a farm in Hebei is rather small compared to other Chinese provinces. In addition the decision of farm households about the types of crops to be planted, and by this the decision between staples or cash crops, depends on soil, climate and other location related characteristics.

In part 3 of this work time periods that are important for understanding and discussing the recent institutional framework in rural China and Hebei are reviewed. The transformation of the Chinese economy from a planned to a market oriented one went different than in other former planned economies. Some reasons for this different development can be found in China’s past institutional system.

In chapter 4 theoretical agricultural household models are discussed that provide the basis for empirically analyzing household behavior regarding the allocation of family labor and for the assessment of the determinants of part-time and full-time farm persistence.
The data set used for the empirical analysis is described in chapter 5. Results for the analyses of poverty and income are presented and discussed in chapter 6. The respective variable sets used and results from the different parametric analyses of the separability test of households’ labor demand and supply decisions, households’ labor time allocation and the persistence of farm structures are presented and discussed in part 7 of this work. Chapter 8 provides conclusions and suggestions for policy and further research.