

Farmers' Perception to Farmland Conversion: A Questionnaire Survey in Xining City, Qinghai Province, China

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Abstract: China is experiencing a fast process of farmland conversion which is conducted mainly by local governments to fuel economic development. Social tension is aroused and policy makers take great concerns on coordinating interests among different stakeholders, especially for increasing farmers' interest. The purpose of this study is to get some insights related to land acquisition institution by exploring farmers' perception to farmland conversion. Participatory Rural Appraisal (PRA) was applied for the investigation in peri-urban area, of Xining City, Qinghai Province, China. The total of 519 householders from 15 villages completed valid questionnaire survey from July to November, 2012. The results indicate that farmland conversion has several impacts on farmers' life. Most farmers are gradually adapting to city life. Higher living expenses and more income are perceived by farmers with average score of 4.21 and 2.69, respectively. The average scores of 2.38 and 2.46 are for improvement of life security and more job opportunities. Farmers expect to get some stable ways of compensation in addition to lump-sum compensation in cash. Stable subsidies every year and obtaining same number of land received strong proposal. And these two options are cited by 49.6% and 43.9% of respondents. Farmland conversion brings about cleaner living condition and more amenities, but lower air visibility and drier air. Results reflect landless farmers' economic and life pressures and various demands. Local government should pay more attention to increase farmers' income and improve rural security system.

Keywords: farmland conversion; farmers' perception; questionnaire survey; Xining City

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1 Introduction

Farmland conversion from agricultural production into urban construction is a common process found in developing countries during industrialization and urbanization (Healey *et al.*, 1990; Heilig, 1994; Guy and Henneberry, 2000; Lin, 2007). In the past two hundred years, economic development, urbanization and transportation construction strongly changed urban forms (Angel *et al.*, 2011). Farmland conversion attracted great attention of researchers. Foreign scholars pay emphasis to the farm-

land's conversion mechanism and resource protection. Some models were built, and have become important analysis tools of land management and assessment (Arrow and Fisher, 1974; Hodge, 1984; Kennedy, 1987). In China, the research is mainly focused on farmland conversion tendency, consequences and sustainable utilization. Farmland conversion is characterized by rapid speed, wide range and high strength. It has caused serious social and ecological problems, as well as promoted the economic development.

Chinese accelerated urbanization and dramatic eco-

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conomic expansion since the 1980s have resulted in the massive losses of farmland resources at an alarming speed (Lin and Ho, 2003). The magnitude of 4.66×10^6 ha had been converted from cultivated land to urban construction between 1982 and 2007 (Sun and Zhang, 2010). As a result, a large number of farmers lost land and had to alter their life style. Rural and urban development in China is experiencing a transition period of both society and economy (Long *et al.*, 2007; Long *et al.*, 2010). However, Farmland non-agricultural conversion presents us with a dilemma. On one hand, this land-use practice is extremely important to regional development, because economic growth demand more land converted from cultivated land (Seto *et al.*, 2012). Many studies in China indicated that the farmland conversion brought out notable economic benefit (Yang, 2004; Tan *et al.*, 2005; Zhu *et al.*, 2008; Sun and Zhang, 2010; Zhang *et al.*, 2010). Further studies revealed that there is an inverse 'U' curve of Kuznets relationship between economic growth and farmland non-agricultural conversion (Qu *et al.*, 2004; He *et al.*, 2008; Li and Wu, 2008). On the other hand, this conversion has resulted in a series of economic, ecological and social problems in China (Cai, 2000; Cai and Yu, 2004; Long *et al.*, 2009). Combination of the loss of farmland, lack of job and insufficient social security make most of farmers become 'three-no farmers' (no land, no job and no social security). The gap between the poor and the rich is widening due to uneven distribution of great benefit from farmland rural-urban conversion among different stakeholders. Great social contradictions thus created. Moreover, land use conversion also directly affects agricultural production and ecological landscape. Therefore, rural development was challenged by food security, economic income of farmers and sustainable utilization of environmental resources (Cai, 2001).

Significant progress has been made in deepening understanding the dilemma of landless farmers. Most researchers recognized that land expropriation make income reduction and loss of living support ways and life guarantee (Shi *et al.*, 2006; Ding, 2007). Furthermore, the compensation for farmers only accounts for very a little share of huge land profit from farmland conversion. Great concerns focus on the equitable distribution among the different stakeholders, including central government, local government, farmer and developer. An important solution is proposed to protect farmers' in-

come rights of farmland conversion by clarifying land property rights and promoting land market growth in rural area (Ma and Qu, 2006; Zhu and Qu, 2006; Wang *et al.*, 2009; He, 2012). Yet, there has been relatively little research on perception to farmland conversion in the view of farmers who, as one of the subjects of farmland expropriation, are the best feedback-providers. They can really perceive the changes from life style, income resource and life security due to farmland conversion. Hence, the improvement of existing land requisition policy and solution to social problems of farmland conversion not only need efforts of scholars, policy makers and managers, but also need direct participation of farmers. The purpose of this paper is to explore difficulties in farmers' lives, and what they need exactly by a questionnaire survey.

2 Materials and Methods

2.1 Study area

This study was carried out in the peri-urban area of Xining City, the capital of Qinghai Province, China. It is located in the eastern edge of Qinghai-Tibet Plateau, with an average altitude of 2275 m. Xining Proper covers an area of 350 km², with a population of 1.2119×10^6 in 2011. Like other Chinese cities, Xining is also experiencing a rapid process of urbanization and industrialization. Urban inhabitants increased from 7.02×10^5 in 1997 to 1.167×10^6 in 2011, and the built-up area expanded by nearly a half in the same period. Xining City has been strongly influenced by its relative isolation from other cities, with 400 km far from the nearest Lanzhou City. As a consequence, landless farmers concentrated in Xining City to look for jobs. The increased pressure of employment intensified the social contradictions. This 'isolated' city provides a perfect area to study farmland conversion.

Xining is a typical valley-basin city embraced by mountains on three sides. The Huangshui River and its two tributaries flow through the whole city, and their cross intersection forms the city center (Fig. 1). The city expands in four directions. From center to periphery, construction land, farmland, forest land and grassland are distributed, respectively. And the former two land use types are squeezed into narrow strips due to physical limitation. Land use patterns had been transformed from farmland-leading to multiple land use types in 2003.

Farmland occupied 34% of total land in Xining Proper in 1996, which decreased to 15% in 2003, while built-up area and grassland increased to 29% and 25% (Chen *et al.*, 2010). A large number of farmland is converted to transportation, industrial park, economic development zones, and residence. After 2004, land use changes become relatively stable, mainly with conversion from farmland to urban construction land.

2.2 Methods

For decades, Participatory Rural Appraisal (PRA) has been always an important tool widely used to assess household livelihood (Zhu *et al.*, 2011; Yan *et al.*, 2011; Li *et al.*, 2012). The combination of semi-structured

interviews and questionnaire investigated farmers' perception to farmland conversion in Xining City. Firstly, we visited village administration to know the overall quantity of expropriated farmland, standard of compensation, placement and current rural life security system. Secondly, we interviewed villagers randomly. It is a good way to collect information about farmers' attitude to land expropriation, life pressure, adaption to new life and some suggestion of compensation. Results were carefully reviewed to improve questionnaire design. At last, the final questionnaire was formed. Considering spatial location, land requisition process, and cropping structure, 15 villages were selected (Fig. 1). The total of 536 households were surveyed at random. There were

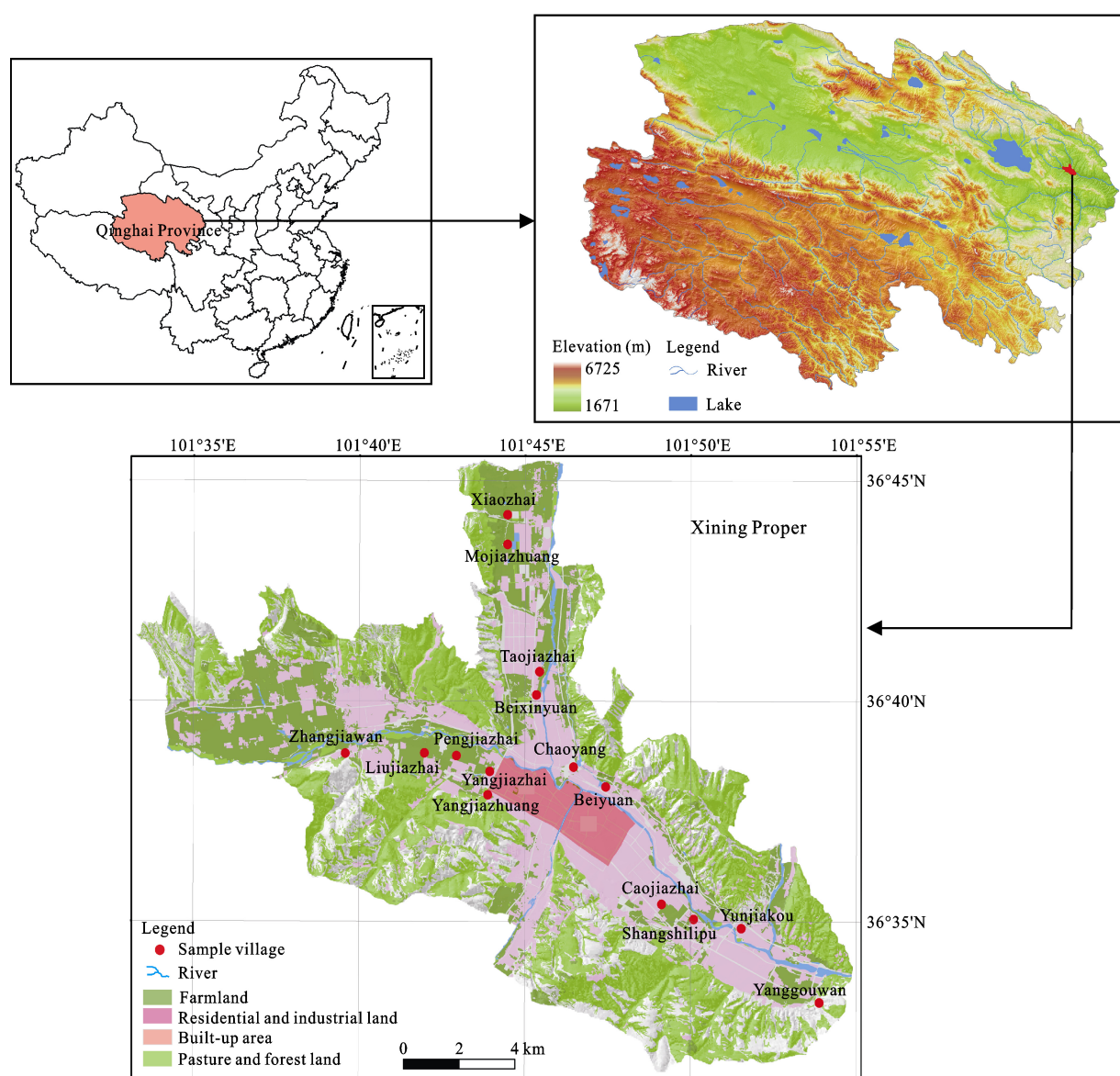


Fig. 1 Location of study area and sample villages

519 valid questionnaires, with effectiveness of 96.8%. The contents of investigation included: farmers' social information, attitude to land expropriation policy and perception to economic benefits, environmental changes and security change of farmland conversion. Questionnaire mainly comprised of a set of closed questions; their answers were on a five interval scale ranging from 1 to 5 representing 'strongly agree' to 'strongly disagree'. The score of 3 is dividing point between 'agree' and 'disagree'.

The villages are very close to the urban center and the per capita farmland there is limited. Thus, rural labor is surplus. The elder of family is our favorite subjects for questionnaire, because most of young people, who are mainly less than 30 years old and lacking agricultural skills, prefer nonagricultural jobs in city than agricultural activity. In addition, the young even do not know the amount of their farmland and the farming income. Therefore, their parents are the actual head of rural household, and could fully perceive changes resulted from farmland conversion. The average age of total respondents is 51.9. In which, only 3.1% of respondents is <31, 49.5%, 30.1% and 17.3% of respondents are 31–50, 51–65 and >65 years, respectively. Perception to farmland conversion is featured by three categories including spatial location, land expropriation degree and land development direction (Table 1).

development direction (Table 1).

3 Results

3.1 Farmers' perception to farmland conversion

The average score of 2.46 for the attitude to land expropriation policy from 519 respondents indicates that householders less welcome farmland conversion (Table 2). There are 58.9% respondents who present dissatisfaction, while only 18.4% respondents hold opposite views and the 22.8% respondents remain indifferent attitude. Farmers' livelihoods are changed due to land expropriation accompanied by shift from rural to urban life style. They have to seek out new and stable source of income. But realities are higher cost of life, less job and lower living security, which lead to farmers' dissatisfaction. Obviously, the contribution of farmland to family life influences farmers' attitude. Farmers in suburb have the best farmland planting efficiency because of more land compared to urbanized area and closer distance to market compared to exurb. Therefore, they strongly opposed to farmland is expropriated with the lowest average scores of 2.13 (Table 2). The average score of 3.00 is obtained from exurban respondents, which presents support for farmland expropriation policy.

Further details were sought from respondents by sub-

Table 1 Information of respondents

Category	Group	Introduction
Spatial location	Urbanized area	Land expropriation took place before 2000. The villages are situated within urban area, and within 2 km range of commercial center. Originally, per capita farmland is less than 0.03 ha, with planting vegetables mostly. The rural life style is transformed. Main sources of income derive from part-time job, individual business, house renting, driving taxi and bonus of village collective industry
	Suburb	Land expropriation took place mainly during 2003–2009. The distance to commercial center is in the range of 3–7 km. Originally, per capita farmland is about 0.04 ha, and vegetables are planted mostly. At present, main sources of income derive from part-time job and driving taxi
	Exurb	Land expropriation took place mainly during 2008–2012. The distance to commercial center is more than 7 km and adjacent to rural area. Originally, per capita farmland is about 0.05 ha, and wheat, oil crops and vegetables are planted. Life style starts to be affected by city. Main sources of income derive from planting and part-time job
Land expropriation degree	Part farmland	Though number of farmland decrease, less influence is for family life. Farmers' livelihoods mainly depend on planting and part-time work
	All farmland	Farmers lose farmland but retain the homestead. Livelihoods are relative diverse, including renting, retail business, part-time job and driving taxi. Life style is characterized by rural dwelling and mixed consumption of rural and urban
	All farmland and homestead	All material of production and living are converted. As a result, complete changes occurred in life style manifested by high cost of building and urban consumption. Farmers' livelihoods mainly depend on part-time job
	Residential district	Farmlands are developed into urban residential district with the most intensive land development. A large number of citizens' migrations alter completely farmers' rural life style
Land development direction	Development zone	Lands are used in high-tech industry and economic development zone with second intensive use. It has well planning and transportation. Fewer jobs are available for farmers
	Public service	Farmlands are used to build up school, hospital and integrated shopping center
	Infrastructure	Farmlands are converted to roads, highway and water channel

Table 2 Farmers' perception to land expropriation policy

	Attitude to land expropriation policy		
	Mean	<i>F</i>	<i>p</i>
Spatial location		32.802	0.000
Urbanized area	2.71		
Suburb	2.13		
Exurb	3.00		
Land expropriation degree		6.685	0.001
Part farmland	2.74		
All farmland	2.31		
All farmland and homestead	2.38		
Land development direction		1.751	0.156
Residential district	2.40		
Development zone	2.24		
Infrastructure	2.42		
Public services	2.59		
Mean	2.46		

sequently three questions: what are the farmland's functions to households; what the desired compensation modes are; and what will do if always possess farmland. The selected frequencies of all options are showed in Table 3.

Farmer's living in peri-urban of Xining proper strongly relies on farming for food, vegetables and work opportunities. Farmlands are distributed mainly on the terrace both sides of river with fertile soil and good irrigation. Better farming benefit thus can be obtained. Supporting living needs, increasing family income, supplying food for society and providing security for the aged are the top four functions. Offering pleasant landscape and enjoying rural life are given less importance. Spatial location and land development direction have statistically significant impact on farmers' perception which mainly associated with planting structure. Urbanized farmers, planting garlic, scallion and leek, sell products directly to urban residents. They obtained good economic return with the highest selected frequencies for increasing family life. Suburban farmers manage greenhouse canopy to grow tomatoes, hot pepper and other vegetables for sales in city market through convenient traffic. Meanwhile, wheat and oil crops are also planted to be used for family consumption. Farmland planting increase family income as well as support living needs. While in exurb, wheat, beans and oil crop are main crops. Agricultural products are mainly used to meet family needs, with part of them to be sold. Agricultural income is relatively reduced, while the func-

tions of supporting living needs, supplying food for society and providing security for the aged are strengthened.

Farmers prefer to stable and long-term compensation modes. Stable subsidies every year and obtaining same number of land received strong proposal respectively cited by 49.6% and 43.9% of respondents. However, current executive mode of lump-sum compensation is desired by only 13.8% of respondents. Landless farmers lose supplies from farmland and have to buy all life consumption in city market, which lead to higher cost of living. Non-farm employment seems to be one of the most important livelihoods for them. Yet, it is difficult to get full employment for them. Most of them obtain low-income work, or even take odd jobs. This distressed situation prompts farmers' desire for stable source of income. In addition, the average age of 51.9 for respondents also affects the results. Elder respondents show stronger desire for stable subsidies. And 38.7%, 45.5%, 51.3% and 63.9% are the selection frequencies of stable subsidies for groups aged <31, 31–50, 51–65 and >65. All groups among spatial location, expropriated degree and development direction have significant difference. Great transforming of rural life style enhances expectation for job placement. Especially the urbanized area, all farmland and homestead expropriated and residential district respondents have the highest selection frequencies within each category. Investment opportunities attribute to more respondents to favor lump-sum compensation in cash. Exurb farmers want more cash to develop ecological agriculture, all farmland expropriated and public service respondents need to add floors of house for renting or manage small businesses.

Respondents are subsequently asked to think of what will they do if they can always possess farmland. Majority of them prefer to maintain original planting, mainly because of satisfactory with original farming benefit. Increasing farming investment becomes the second important choice. And different ideas are provided by interviews. Urbanized area respondents point out that ecological agriculture has good investment potential: 'ecological garden, with deliberately growing some green plants, can attract a large amount of citizens to visit'. All farmland and homestead expropriated farmers wish to develop agricultural specialization. A kind of vegetable or fruit is cultivated, such as mushroom or strawberry, by using special planting technology and facilities. And for residential district farmers,

Table 3 Response of farmers to farmland conversion

All respon- dents (%)	Householders within spatial location groups (%)				$p(\chi^2)$	Householders within land expropriation degree groups (%)				$p(\chi^2)$	Householders within land development direction groups (%)				$p(\chi^2)$
	Urbanized area	Suburb	Exurb	Part farmland		All farmland	All farmland and homestead	Residential district	Devel- opment zone		Infra- structure	Public service			
Farmland's functions to households					0.013					0.505					0.000
Supporting living needs	73.0	71.8	72.3	75.9		75.2	67.1	75.4		68.1	69.6	80.0	74.4		
Increasing family income	66.8	70.7	69.9	55.2		65.1	70.6	65.5		72.9	86.9	68.2	56.4		
Supplying food for society	60.6	53.4	62.4	63.8		66.9	51.4	62.1		51.8	45.5	64.5	69.7		
Providing security for the aged	41.1	36.7	40.8	46.6		45.0	42.5	36.9		42.8	45.5	35.5	42.1		
Offering pleasant landscape	17.0	24.2	11.7	22.4		16.6	17.8	16.8		20.5	8.8	10.9	19.5		
Enjoying rural life	4.8	9.0	3.9	2.6		2.4	4.8	6.9		12.0	2.1	1.8	1.0		
Desired compensation modes					0.000				0.000						0.000
Lump-sum compensation in cash	13.8	23.5	9.6	14.5		12.2	21.9	9.5		16.1	4.3	6.7	17.9		
Stable subsidies every year	49.6	41.7	54.8	44.5		45.3	49.3	52.5		47.2	54.3	51.9	49.2		
Obtaining same farmland	43.9	34.8	46.6	46.4		52.5	28.8	48.4		30.4	43.5	60.6	46.2		
Job placement	16.0	22.6	16.0	9.1		10.1	12.3	22.2		27.3	13.0	12.5	9.2		
What will do if always possess land					0.000				0.000						0.000
Maintaining original planting	59.7	49.6	63.3	60.7		63.0	61.1	55.8		49.1	56.5	72.6	62.1		
Increasing agricultural investment	23.7	36.3	20.6	18.8		16.4	19.4	33.0		38.4	21.7	9.4	20.0		
Converting farmland	13.6	6.2	14.9	17.9		18.2	16.7	7.6		6.9	19.6	17.0	15.9		
Renting land	3.0	8.0	1.1	2.7		2.4	2.8	3.6		5.7	2.2	0.9	2.1		

Note: for the first two multiple choices, sum of their selected frequencies exceed 100%

they hope to expand scale of planting vegetables.

3.2 Farmer's perception to economic benefits of farmland conversion

The average scores of 2.69 and 4.21 are for more income and more living expense (Table 4). The vast majority of respondents (88.6%) confirm that more living expenses are resulted in. Meanwhile, only 27.7% of respondents consider that their family incomes are increasing. There are no or less agricultural products supplied for family due to farmland acquisition. Farmers thus need to buy some foods, vegetables and other daily consumer goods, which increase the cost of living accordingly. However, lump-sum full compensation takes no consideration of farmers' employment. Xining, as a less developed city, obviously has not enough jobs for recruiting labors released from farming. With limitations of education level, work experience and age, farmers mainly enjoy in part-time work with low pay and instability. For farmers in Xining City, there is less chance in non-farm employment, but loss of living support from farmland. Therefore, farmland conversion reduces household income and increases the cost of living.

The average scores of 3.65 and 3.56 are separately for higher farmland price and better farming benefit (Table 4). It reveals that general cognition accord to these two appreciations of land value. Farmland non-agricultural conversion is driven by comparatively low utilization efficiency, economic growth and living conditions im-

provement. As a reaction, urbanization and industrialization give rise to higher farmland price. It receives support of 59.3% of respondents, while 25.2% of respondents are against. The quantity of farmland decreases, but demand for agricultural products increases. Thus, farming benefits improve distinctly. The 'agreement' assessment is given by 61.5% of respondents, while the minority (28.5%) opposes and the remainder (10%) retains 'unsure'. Farmland conversion of Xining City not only increase farmland price but also improve agricultural activity. The further analysis of farmers' perception to economic benefits is showed in Table 4.

The respondents in the groups of urbanized area, all farmland and homestead and residential district have the strongest perception to more living expense among each category. The average scores are 4.29, 4.31 and 4.51, respectively (Table 4). Land development direction presents significant difference on perception to more living expense, but not for the rest two categories. Farmers with proximity to urban residential areas are influenced greatly by the city. Their living consumptions completely depend on urban market where the price of farm products is far higher than rural market. Moreover, abundant and various goods in urban market induce changes of farmers' consumption structure. For example, the staple food of single noodle has been replaced by rice and pasta. More fruits and child snacks are also needed. Therefore, combination of higher price and more consumption types prominently increase more living ex-

Table 4 Disparity of farmers' perception to economic benefits of farmland conversion

	More income			More living expense			Higher farmland price			Better farming benefit		
	Mean	<i>F</i>	<i>p</i>	Mean	<i>F</i>	<i>p</i>	Mean	<i>F</i>	<i>p</i>	Mean	<i>F</i>	<i>p</i>
Spatial location		33.323	0.000		0.698	0.498		12.839	0.000		6.269	0.002
Urbanized area	3.17			4.29			3.96			3.79		
Suburb	2.35			4.22			3.40			3.59		
Exurb	3.01			4.16			3.85			3.27		
Land expropriation degree		4.750	0.009		2.425	0.089		0.869	0.420		3.792	0.023
Part farmland	2.90			4.13			3.72			3.35		
All farmland	2.52			4.17			3.65			3.70		
All farmland and homestead	2.65			4.31			3.56			3.61		
Land development direction		9.686	0.000		10.166	0.000		9.625	0.000		3.663	0.012
Residential district	2.82			4.51			3.93			3.74		
Development zone	1.89			4.15			3.57			3.78		
Infrastructure	2.68			4.12			3.19			3.34		
Public services	2.76			4.05			3.64			3.48		
Mean	2.69			4.21			3.65			3.56		

pense. 'Agreement' assessment for more living expense is given by 94% of residential district respondents, while 89%, 87.4% and 84.6% for development zone, infrastructure and public services groups ($\chi^2 = 15.671$, $p = 0.016$).

Spatial location, land expropriation degree and land development direction have statistically significant difference in more income. The average score of 2.35 for more income is obtained from respondents in suburb group, while the average scores of urbanized area and exurban respondents are both more than 3 (Table 4). Inverse perception results are observed. Only 16.3% of suburban respondents conceive more income, but 46.7% and 35.9% for the latter two ($\chi^2 = 66.353$, $p = 0.000$). Urbanized villages, farmland expropriated early, established village collective industries taking advantage of part of compensation. Young villagers are paid salary and old villagers get living subsidy. But this case is forbidden for suburban villages. Their incomes are reduced due to lost farmland. In addition, part farmland expropriated respondents has higher average score (2.90) than other two groups with average scores of 2.52 and 2.65. (Table 4) This may be related to better farming benefit in Xining City. Development zones cause great negative impact on farmer's family income with average score of 1.89. Only 4% of respondents consider more income, while other groups of land development direction considering more income are 31.1%, 28.8% and 29.1% separately ($\chi^2 = 27.244$, $p = 0.000$). High and new technology industries are placed in the development zones. Few jobs are available for farmer compared with other land developments. Spatial location affects farmers' perception to higher farmland price and better farming benefit. Urbanized area respondents present the highest average scores of 3.96 and 3.79 to these two options (Table 3). Because of high price and diverse consumption of farming products, more respondents in urbanized area (65.8%) than suburb (62.1%) and exurb (55.6%) agree with better farming benefit ($\chi^2 = 30.673$, $p = 0.000$). For example, potato, cabbage and beans are main home cooking foods for exurban farmers. Except for these farming products, hot peppers, tomato, cucumber and other season vegetables become urbanized farmers' home dishes. In addition, urbanized area farmers also attach more agreement with higher farmland price. 'Strong agreement' is perceived by 48.3% of respondents, and the same assessment are given only by

23.4% and 24.8% for suburb and exurb groups ($\chi^2 = 70.491$, $p = 0.000$). It is related to farmers' strong desire to investment for farmland due to approaching to city center. The development directions reflect farmers' response to changes of surrounding conditions. Intensive land development direction strengthens the cognition of better farming benefit. The development zone and residential district gathered high density of building and population, with respondents' average scores of 3.78 and 3.74 (Table 4). It is strongly supported by 69.6% and 64.7% of respondents from development zone and residential district groups, with 59.5% and 56.8% for public service and infrastructure groups ($\chi^2 = 24.723$, $p = 0.016$). Similar differences appear to appreciation of farmland. 'Strong agreement' is expressed by 44.9% of residential district respondents, but only 12.6% for infrastructure group.

3.3 Farmer's perception to environmental changes of farmland conversion

Farmland conversion causes landscape changes in Xining City. The average score of 3.86 for cleaner living environment implies that farmland conversion bring out positive changes in farmers' dwelling condition (Table 5). It is supported by 75.7% of respondents, while only 8.3% disagree and the remaining 16.0% are unsure. Urban construction is making living conditions cleaner and tidier. High-rise buildings and well planning development zones replace the traditional farmhouse. Highways are substituting for uneven dirt road. Recreation facilities are built. Many farmers describe that 'plaza is available for recreation.... beautifully designed buildings are close'. However, eager to farmland landscape is strongly expressed with average score of 4.15 (Table 5). It is supported by 90.4% of respondents. They feel relax and happy from farmland landscape, as an interviewer said 'how can I wish to run into field to weed, fertilize... great pleasure will be as soon as seeing crops'. Clean and beautiful living environment and pleasing farmland are both perceived by farmers. The former is affected by daily life while the latter by psychological desire. Hence, it is necessary to coordinate distribution between rural and urban landscape.

Farmland conversion changes microclimatic. Xining City belongs to continental plateau semi-arid climate, with an average annual precipitation less than 400 mm while corresponding evaporation more than 1300 mm.

When urban buildings extend to rural area, countryside covered by vegetation is converted into impervious surface. Change of underlying surface increases surface temperature and reduces air humidity. Totally 59.9% of respondents feel air getting drier and average score of 3.59 is obtained (Table 5). Even more important, land development is followed by population migration and distribution of transportation and power facilities. Air quality is affected negatively by emissions of SO₂, NO₂ and suspended particulate matter. Air visibility is thus reduced. It is perceived by 63.3% of respondents with total average score of 2.37 (Table 5). The further analysis of the perception to environmental change is showed in Table 5.

Spatial location has significant impact on farmers' perception to cleaner living environment with average score of 4.29 for urbanized area respondents (Table 5). Public facilities are convenient to use. More farmers in urbanized area (93.3%), compared with those in suburb (69.1%) and exurb (73.5%), are strongly expressed cleaner living environment ($\chi^2 = 42.431$, $p = 0.000$). Also, land expropriation degree and land development direction have statistically significant impact. The high average scores of 4.02 and 4.00 are respectively for all farmland expropriated and development zone developed respondents (Table 5). It is agreed by 84.9% of all farmland expropriation, 69.9% of part farmland and 73.6% of all farmland and homestead expropriation ($\chi^2 =$

45.970, $p = 0.000$). Land development with well planning can promote farmers' living conditions because of clean street, beautiful building and perfect public facilities. The ratios of agreement among four development directions are 91.3% for development zone, 76% for residential district, 61.3% for infrastructure and 80% for public services ($\chi^2 = 75.776$, $p = 0.000$).

Higher air visibility and drier air present disparities among three categories, and all have statistically significant difference (all $p = 0.000$). As mentioned above, farmland conversion reduces air visibility and makes air drier. Farmers in residential district perceived the worst air quality. The average scores for higher air visibility and drier air are 1.81 and 4.18 (Table 5). There are 82% and 78.4% of respondents consider lower air visibility and drier air respectively, which are far higher than other three groups (lower air visibility: $\chi^2 = 45.487$, $p = 0.000$; drier air: $\chi^2 = 44.166$, $p = 0.000$). The next is urbanized area farmers with corresponding average scores are 1.87 and 4.11 (Table 5). Farmers with all farmland and homestead expropriated also easily suffer from urban air pollution and 'hot island' effect because they are left countryside for city completely. The average score of 2.19 is for higher air visibility and 3.77 for drier air (Table 4). Majority of respondents (69.6%) confirmed lower air visibility ($\chi^2 = 10.382$, $p = 0.034$) and 65.2% of respondents conceived drier air ($\chi^2 = 13.104$, $p = 0.011$).

Table 5 Disparity of farmers' perception to environmental change of farmland conversion

	Cleaner living environment			Higher air visibility			Drier air			Eager to farmland landscape		
	Mean	F	p	Mean	F	p	Mean	F	p	Mean	F	p
Spatial location		31.758	0.000		18.050	0.000		21.074	0.000			1.110
Urbanized area	4.29			1.87			4.11			4.23		
Suburb	3.65			2.49			3.48			4.13		
Exurb	3.79			2.56			3.35			4.10		
Land expropriation degree		6.275	0.002		8.657	0.000		9.300	0.000		0.540	0.583
Part farmland	3.73			2.64			3.30			4.11		
All farmland	4.02			2.36			3.63			4.19		
All farmland and homestead	3.77			2.19			3.77			4.14		
Land development direction		3.205	0.023		26.794	0.000		31.052	0.000		6.175	0.000
Residential district	3.88			1.81			4.18			4.30		
Development zone	4.00			2.50			3.50			4.22		
Infrastructure	3.64			2.58			3.34			4.14		
Public services	3.85			2.69			3.27			3.99		
Mean	3.86			2.37			3.59			4.15		

3.4 Farmer's perception to social security of farmland conversion

The losses of living support based on farmland exceed what compensation may be. The average scores of 2.38 and 2.46 are separately for improvement of living security and more job opportunities (Table 6), indicating general disagreements. Farmland is one of the largest assets for farmers. Though relatively low benefit, it can supply stable support and employment, as well as increase family income. Nevertheless, compensation in cash from farmland conversion has risks in devaluing and investment. Hence, 73.4% of respondents considered that compensation can not sustain their life in long run. And 62% of respondents conceived less work opportunities and sit around.

The average score of 3.96 for close to more amenities present general satisfaction (Table 6). Farmland's non-agricultural conversion extend infrastructure and perfect public services. Farmers in Xining City are more available to urban public resources, including education, transportation, hospital and other facilities. Majority of respondents (87.2%) agree that farmland conversion brought about advantageous travel and made life more convenient. The detailed perceptions to social security are showed in Table 6.

Spatial location has statistically significant impact on farmers' perception to improvement living security. The respondents in suburb received the biggest negative in-

fluence, and average score is 2.17. As noted above, more labor and money are invested in farming. They plant seasonal vegetables and fruit, like strawberry, through building plastics canopy. Land expropriation results in the reduction of family income and loss of ways of living support. Hence, Only 8.5% of respondents are for 'agreement', compared with 25% in urbanized area and 15.4% in exurb ($\chi^2 = 28.544$, $p = 0.00$).

Three categories of spatial location, land expropriation degree and land development direction have all significant relationships to the perceptions to more job opportunities and close to more amenities. Urbanized area, suburban, all farmland and homestead expropriated, and residential district developed respondents present low average scores of 2.38, 2.38, 2.31 and 1.99, respectively (Table 6), which indicates bigger employment pressure. More farmers in urbanized area (63.3%) than in exurb (49.6%) consider that fewer jobs are available for them and they often do nothing ($\chi^2 = 15.067$, $p = 0.005$). Exurb of Xining Proper is a good place for ecological amusement, diversified agriculture is developed. For example, Yanggouwan village, located in the east of city, spring up peasant-household tourism. All farmland and homestead expropriated farmers lose all farming jobs and have to enjoy in non-farming jobs absolutely. And 68.3% of respondents confirm fewer jobs, vis-à-vis 52.7% of part farmland requisitioned ($\chi^2 = 13.729$, $p = 0.008$). Similarly, 78.4% of respondents whose farm-

Table 6 Disparity of farmers' perception to security change of farmland conversion

	Improvement of living security			More job opportunities			Close to more amenities		
	Mean	<i>F</i>	<i>p</i>	Mean	<i>F</i>	<i>p</i>	Mean	<i>F</i>	<i>p</i>
Spatial location		18.252	0.000		0.027	3.642		11.998	0.000
Urbanized area	2.72			2.38			4.19		
Suburb	2.17			2.38			3.75		
Exurb	2.50			2.69			4.00		
Land expropriation degree		2.093	0.124		4.467	0.012		17.748	0.000
Part farmland	2.49			2.66			3.88		
All farmland	2.35			2.47			4.25		
All farmland and homestead	2.30			2.31			3.71		
Land development direction		1.375	0.250		18.578	0.000		4.343	0.005
Residential district	2.41			1.99			3.72		
Development zone	2.15			2.30			4.13		
Infrastructure	2.31			2.62			4.01		
Public services	2.42			2.78			3.96		
Mean	2.38			2.46			3.96		

lands are used for residential district hold this view, vis-à-vis 50.8% of public services developed ($\chi^2 = 33.236$, $p = 0.000$).

Significant different perceptions to close to more amenities are observed by spatial location, land expropriation degree and land development direction categories. The average scores of all farmland expropriated, urbanized area and development zone respondents rank the top three, which are 4.25, 4.19 and 4.13, respectively (Table 6). Promotion of location advantages facilitates travel and daily life. Xining, as a city with strip form, is inevitable to strengthen radiation function of city center to surrounding area during urban growth. Transportation, hospital, composite shopping market and other public service are perfected. Great conveniences are conceived by 89.2% and 77.7% for urbanized area and suburban respondents. Land development direction also brings about great improvement of location advantages. More respondents of all farmlands expropriation (94.5%) than all farmland and homestead expropriation (75.3%) agree close to more amenities ($\chi^2 = 38.572$, $p = 0.000$). And also, land development direction significantly affects farmers' response. Attitude of 'agreement' is given by 89.1% and 69.5% for development zone and residential district groups ($\chi^2 = 48.851$, $p = 0.000$).

4 Discussion

Farmland conversion is a complicated and long-term process. It causes social, economic and environmental problems. Taking various surveys and coordinating multi-stakeholders' interest are especially important to develop regional land use policy. Farmers' demand and expectation are always neglected in the decision-making of land expropriation. For the users of farmland, they are only involved in the first stage of land expropriation by receiving compensation and residence replacement. Great dissatisfaction thus is raised, and which increase the tension between farmers and local government. The participation of farmer should be visible both in the process of land expropriation and compensation mode decision-making.

Land expropriation brings higher living cost to households, which leads to a lot of complaints. Neither government, nor farmers consider fully how changes in life, housing and surrounding environment would happen. For farmers, loss of farmland means loss of impor-

tant life support. Compensation is so little when farmers are faced all kinds of expenses, such as buying house, heating facilities, waste disposal, food, vegetables and other living consumptions. Let alone, it can sustain long-term life. Thus, how to reduce farmers' cost of living becomes an urgent requirement to improve their life quality. Local government should pay more attention to increase landless farmers' welfare and subsidies.

Job becomes the biggest challenge for farmer. Before farmland expropriation, many farmers take off-farm jobs beside agricultural planting. They like flexible work because they can both take care of crops and increase family incomes. But now, off-farm jobs become an important, or even the only source of income. They are eager to get steady jobs. However, landless farmers' employment is not optimistic. The majority of them work as waiter, cleaner, doorman and drivers with low and unstable income. Especially, for those over the age of 45 years, they are almost turned away. Hence, some measures should be taken to increase job opportunities. The development of ecological agriculture will increase the possibilities of getting jobs and economic benefit.

Farmland conversion has different impacts on farmers according to spatial location, land expropriation degree and land development direction. Farmlands are expropriated earliest in urbanized area; farmers have adapted the urban life style. Suburban farmers greatly depend on farmland, while exurban farmers increase incomes by taking non-farm job and get agricultural productions by planting. For part farmland expropriated farmers, off-farm job become a preferential way to increase family incomes. For all farmland expropriated farmers, they add floors to their rural houses for renting. And for those who lose all farmland and homestead, they hope to buy more than one set of houses to support family stably by renting redundant house. The results are that urbanized area farmers have higher incomes, and part farmland expropriated farmer perceived less job pressure. It indicates that scale and speed of land expropriation should be controlled to make farmer gradually adapt to the city life.

The current 'one size fit all' cash compensation can not meet farmers' need. Compensation following 'functions replacement' principle probably is a good way to protect farmers' interests. From this case study, lump-sum compensation in cash just gets a little support, which suggests that farmers need more forms of support.

Hence, abundant of households' survey should be conducted before land acquisition. With an understanding of the roles of cultivated land to farmers, some measures can be designed to improve farmers' living security and increase suitable jobs according to local conditions. For example, development of ecological agriculture is beneficial to farmers' employment, incomes increasing and environment improvement. Flexible ways should be offered to meet farmers' various demands.

5 Conclusions

Farmland has multiple roles to farmers in peri-urban of Xining City. Though per capita farmland is limited, better farming benefit not only meets family life but also increases income. In general, farmers less welcome land expropriation policy and hope to sustain farming. Besides lump-sum compensation in cash, more stable ways were strong needed in compensation.

Farmers' perception reflects the negative and positive influences on economic benefits, environmental changes and social security. Farmland conversion leads to householders' economic pressures with increasing living expense and reducing family income. As well as social pressure are mainly from lack of living security and less job opportunities. However, city construction makes farmers close to more amenities and share cleaner living environment, which leads to lower air visibility and drier air.

Spatial location, land expropriation degree and land development direction have different impacts on farmers' perception. Suburban farmers conceived most economic and living pressures. Urbanized farmers basically adapt to city life and exurb farmers have less life pressure by relying on farmland resources and off-farm jobs; similar, all farmland and homestead expropriation give rise to lack of living security and great job pressure. Farmland converted into residential district causes least jobs and most living expense, while farmlands used as development zone significantly lead to less income and living security.

In addition, farmland conversion does not mean more job opportunities for farmers. They are making great efforts to adapt to the city life. Part-time job, renting, driving taxi and small business become main livelihoods of the landless farmers. In particular, most of them take renting house as long-term living security which has

potential risk from social problems. Therefore, it is very necessary for local government to improve farmers' employment, life and pension security system.

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