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**Structural change, land use and the state in China:
making sense of three divergent processes**

Murat Arsel
Anirban Dasgupta

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Abstract

Rapid economic growth involves significant changes in land use patterns. The paper uses the recent history of Chinese economic growth to highlight and interrogate the implication of such changes within the context of structural transformation. It argues that though land use change is an important underlying dimension of the massive structural transformation accompanying China's explosive economic growth, the dominant theoretical literature on structural change is not cognizant of this fact. It does so by looking at arable land conversion in coastal provinces (from agriculture to industry or urban development), the 'Grain for Green' land set-aside program to prevent soil erosion in central and western areas, and 'wasteland' reclamation particularly in the northwest. In so doing, it also argues for an integrated analysis that recognizes that land has a type of scarcity that arises from its location and not just its total availability at the national level, i.e. land here is not the same as land there. The paper shows that contrary to the implicit understanding of structural change literature and indeed development theory, the transition of land in China between its uses defies the dominant linear and unidirectional narrative. The three processes discussed here show that land—and population dependent on its livelihoods on these lands—move in different directions and purposes and these movements are shaped and determined by state vision of progress and development.

Keywords

China, land, state, structural change, economic growth.

Structural Change, Land Use and the State in China: Making Sense of Three Divergent Processes

1 Introduction

Especially since the early 1980s, China has followed a rapid path of economic growth. Economic growth figures for the past two decades (1980-90: 10.3%, 1990-2003: 9.6%) are impressive by any standard and the Chinese government aims to quadruple the nation's GDP by 2020, implying an average growth rate of 8 percent. Within the context of China's unprecedented growth, land use change has received much attention (Deng et al. 2008; Deng et al. 2009; Huang et al. 2008, Yan et al. 2009; Eyferth et al. 2003). Most of this literature focuses on specific programs (e.g. Sloping Land Conversion Program (Xu et al. 2010; Uchida et al. 2005) or phenomena (e.g. conversion of agricultural land for purposes of urban industrial development (Su 2005, Tan et al. 2005; Liu et al. 2010). Though empirically detailed, these analyses have not engaged with the broader interconnections and implications of the divergent processes of land use change in contemporary China. This paper fills this void by providing an integrated analysis of three concomitant processes involving land use change. Specifically, the paper looks at arable land conversion in coastal provinces (from agriculture to industry or urban development), the 'Grain for Green' land set-aside program to prevent soil erosion in central and western areas, and 'wasteland' reclamation in China's border provinces particularly in the northwest.

The purpose is not to present new empirical evidence. Rather, by synthesizing the rich empirical literature, the paper highlights the importance of land use change as an important dimension of the structural transformation accompanying China's impressive economic growth. In so doing, the paper also engages with the classical literature on structural transformation, which is drawn primarily from the discipline of economics. It argues that this literature, which focuses on the transfer of labour and capital from more traditional agricultural sector to modern industrial and service economy, has a blind spot when it comes to land, particularly its movement between different productive purposes. The paper makes four interrelated arguments regarding the role of land in structural change that accompanies economic growth.

As a starting point, it's important to note that the structural change literature does not consider the supply of land—as a productive resource—as a constraint to economic growth. Instead, it simply deals with the productive capacity of land for agricultural purposes, in other words its fecundity, which is indeed perceived as a constraint. However, this constraint is expected to disappear as structural change leads to industrialization. The physical supply of land—as space—and also its particular location—as place—which is required for the construction of factories, urban residential districts for factory workers, infrastructure for transportation, etc., is not brought under scrutiny. As a result, the structural change literature is unable to grapple with the agricultural, socioeconomic and environmental implications of structural change that leads

to industrial development. By juxtaposing the three processes unfolding in contemporary China, the paper aims to demonstrate the importance of paying attention to land and its physical availability to understand the process of structural change and economic development.

The second argument concerns the direction of movement of land between different productive purposes. Within the classical structural change literature, the movement of land is implicitly assumed as taking place in a unidirectional manner. Specifically, since economic growth is envisioned as a process leading to industrial development, the shift in land use is expected to move from agricultural production to industry (and its associated needs such as transport infrastructure, residential development, etc.). Because land is conceptualized solely in terms of its potential for supporting agricultural production, the existing literature is not capable to capture other 'states' of land, namely as 'wasteland' or 'nature'. As the processes taking place in China demonstrate, land can also move to and fro between agriculture and these other two states. In particular, the process of land reclamation demonstrates how land that is traditionally considered as 'waste' – thus as economically unproductive – can be 'reclaimed' and moved into agricultural production. Similarly, the discussion of 'Grain for Green' program shows that land is also moved out of agricultural production not to industry but to the provision of ecosystem services (e.g. flood prevention). Just as classical approaches to structural change fail to consider the potential of 'wastelands', they also are not able to account for the necessity and, therefore, value of ecosystem services which are now acknowledged as critical for economic growth. By demonstrating the existence and salience of these alternative paths for the movement of land, the paper highlights their importance for the construction of a more robust theory of structural transformation.

Classical theories of structural change depict the transition of an economy from a poor agrarian structure to a more affluent industrial one as a natural and teleological process. To the extent that the state enters these discussions, it is to argue that it can help prepare the groundwork for such a transition or that it 'facilitates' it by managing its social and political side effects. This oversimplification of state role and function is the third leg of the argument of this paper, namely that the state in China is central to the planning, management and execution of structural transformation and its effect on land use. In initiating, undertaking and overseeing a set of complex processes, the state in China might indeed be following the same simplistic model of structural change espoused by classical theories. The paper argues that structural change involves numerous politically motivated decisions (i.e. regarding the location of industry, design of ecosystem service provision, etc.) taken by the state that cannot simply be explained by reference to simple economic precepts dictating the necessity of structural change.

The fourth and final point emerging from these previous three insights is that an integrated analysis of the variety of land use changes in China is essential to a sound understanding of the social, environmental, and political impacts of the process of China's rapid economic growth. Such an integrated analysis would need to recognize that land has a type of scarcity that arises

from its location and not just its total availability at the national level, i.e. land here is not the same as land there.

2 Structural Change

This paper engages with the literature on structural change that has been articulated by, *inter alia*, Fisher (1939), Clark (1940), Kuznets (1965; 1966) and Chenery and Syrquin (1975). While it has its roots in the classical tradition of economics, the inquiry of structural change has flourished as a research program with these authors, whose work remains central to the contemporary understanding of economic growth and its determinants. Broadly speaking, structural change can be understood to include the entire range of transformative processes that accompany economic growth such as the changes in sectoral composition of production and employment, organization of the industry, financial system, income and wealth distribution, and demography (Matsuyama 2008). However, at its core is the accumulation of physical and human capital and the changes in the sectoral composition of the economy.

Rather than a theoretical framework, the literature on structural change is built upon a set of careful analyses of empirical evidence that demonstrate some robust trends within a country during a period of sustained economic growth. Kuznets (1965, 1966) documents how along with increase in per capita income, the share of agriculture declines in the national product and in employment with a corresponding increase in the share of industry and services. This trend was found to hold both in the context of time series data for individual countries and in cross-sectional data for different countries.

On a more analytical level, Lewis (1954), following the classical tradition in economics, explains the central dynamics of growth in an economy in terms of the movement of labour from the rural agricultural to the urban industrial sector in response to a higher wage rate (traditional/modern?). A corollary to this movement is the same change in the relative weights of the agricultural and non-agricultural sectors in the economy that Kuznets established. This idea of structural change is not tied exclusively to a capitalist system either theoretically or empirically. The literature on Soviet industrialisation (e.g. Erlich, 1950; Ellman, 1975) is replete with references to transfer of resources like labour and commodities from agriculture to industry.

Interestingly, the entire literature on structural change and economic growth does not deal with the issue of transfer of land between its different uses. This is clearly the case with Kuznets (1965: 250) in his discussion of the role of agriculture in economic growth. He states that agriculture can make three types of contributions: “a product contribution” (through self/internal growth), “a market contribution” (through trade with other sectors), and “a factor contribution” (through a transfer of resources to other sectors). It would be reasonable to expect that land would be one such factor, which could be transferred, or contributed in his parlance, to another sector such as industry. Yet, Kuznets limits these factors to two, namely “capital, that is, funds for financing acquisition of material capital, [and] labor” (ibid). Not only this otherwise sound discussion does not bring up land as a resource that gets

transferred between different sectors, it does not attempt to explain its absence.

Evidence of such omission abound in the literature. In his discussion of the relationship between agriculture and modernizing economic growth, Timmer (1988: 289) critiques the ‘extractivist’ view of agriculture, which envisions its contribution solely in terms of providing “[s]urplus labor, surplus savings, and surplus foreign exchange to buy the machines to make them” in order to “fuel the drive for modernization”. Arguing instead for an interventionist policy for supporting agriculture-led development, Timmer nevertheless does not pay sufficient attention to land beyond its significance for agricultural production. In other words, for Timmer, the supply of land is only a relevant concern for agriculture, since it is “the only major sector that uses the land surface as an essential input into its production function” (1988: 296). In formal neoclassical modeling, land is similarly characterized as of being useful solely for agriculture. For instance, Laitner’s model to explain the dynamics of savings behaviour in the economy within the context of structural change starts with an assumption that “[o]nly agriculture uses land” (Laitner, 2000: 545). In short, land is considered a relevant factor of production for agriculture alone and therefore the intersectoral dynamics that is associated with structural change does not have to deal with it.

This brief overview shows that for the structural change literature the role of land is only considered from the vantage point of agriculture and no other uses are envisioned for it (e.g. industry). It is important to understand the rationale behind this position. In explaining how an economy moves from rural agricultural to urban industrial character, the structural change literature makes an implicit assumption that the land necessary to locate industrial facilities (factories, urban infrastructure, housing for workers, etc.) is in abundant supply and therefore does not impinge on land necessary for other productive purposes (e.g. agriculture). This assumption would be valid in principle if the specific location of industry were immaterial. In other words, if location did not matter, ‘land here is the same as land there’ and there would always be some land available to set up industries. Moreover, it was assumed (and rightly so, to an extent) that industrial production, being much less land intensive than agriculture, would require negligible quantities of land. Together, these provided the grounds to assume that there was no binding land constraint to the process of growth via industrialization.

To the extent that land constraints were taken into account, these were thought of primarily through the lens of agricultural productivity. Specifically, it was anticipated that intensification of agricultural production would in the long term deplete the fertility of land. Furthermore, it was initially believed that the growth process would be “protected from the braking effect of this law by the shift away from agricultural inputs to other natural resources” and later the constraint was kept out of sight using a “fixed coefficient production function approach” (Doornbos et al., 2000: 3). Related to this view of the natural constraints on production processes (i.e. agricultural) is the absence of any consideration of the functions played by nature – as an integrated system – in supporting economic life.

At the initial stages of industrialization, the relative abundance of land and therefore its easy availability for expanding the industrial base of an economy meant that potential tensions between competing uses of land were less likely to occur or to be perceived as a major stumbling block. However, upon the attainment of a threshold level of economic maturity and associated industrial intensification, this would cease to be true and competition for land among its alternative uses becomes manifest. In addition, three interrelated contemporary dynamics further exacerbate the tension arising from the competition between the different uses of land. Across the developing world the period since the Second World War has seen several waves of democratization (O'Donnell et al., 1986). Despite its weaknesses, this process has lent a voice to marginalized and disenfranchised sections of many developing societies. This, coupled with the rise of what has been termed the 'network society' (Castells, 1996), has often enhanced the abilities of these communities to share and articulate their concerns and grievances regarding the shifts taking place between the different uses of land. Paralleling these trends has been the growing awareness of the impact of development processes on the world's ecosystems. Within the context of land use tensions, this has introduced an additional variable concerning the viability and desirability of transferring land between its different potential uses (Adams, 1990). Lastly, the entire development project, which has been envisioned through industrial economic growth, has come under increasing scrutiny and criticism from various quarters and constituencies (Rist, 2009). All this has meant that rampant transfer of land between its different uses has become much more contentious and therefore in need of better analysis.

As the proceeding section will demonstrate within the context of China's rapid economic growth, such an analysis needs to pay attention to at least three separate tensions arising from land use change. The first concerns the shift of land from agriculture to industry. This arises not from the absolute scarcity of land at the national level but rather the specific location at which land for industrial development (defined broadly to include factories, transport infrastructure and housing) is necessary. Specifically, China's long standing 'coastal development strategy' that has, among other concerns, sought to take advantage of easy transport connections with export markets has resulted in a clash between the region's need for additional space for industrial growth and the needs of peasant farmers to retain possession of agricultural land surrounding urban centers. The second tension arises from the recently apprehended need to sustain the health of ecosystems, which, having come under increasing stress during industrial development, are necessary to sustain the conditions required for future growth. In the case of China, this paradox has most clearly manifested itself during the catastrophic floods of 1997 and has resulted in the central government's massive undertaking to create a 'green belt' by converting agricultural land to forests for conservation purposes. The final tension arises partly out the need to expand land available for agricultural production and partly due to complex political considerations regarding the control over national territory as a whole. The case of Xinjiang clearly demonstrates how the reclamation of what has been 'wastelands' has not only created vast swathes of 'new' arable land but has also been accompanied by intense political and sociocultural conflict.

3 Processes and Programs

This section provides a brief overview of three separate processes and analyzes their progress and impact. Since the manifestation of each process can be observed at its clearest in a certain geographical area, the analyses in this section are accordingly focused on specific regions in China that have been affected. For each process, we provide a brief historical overview, present relevant data on size and nature of change, discuss the role of the state and evaluate the nature of impact on various stakeholders.

3.1 Industrialization

Especially since the economic reforms starting in 1978, China has been undergoing a process of urbanization and industrialization that has few, if any, parallels in pace and magnitude. Its recent economic performance has been outstanding with an average growth rate of almost 10 percent annually. Much of this growth has come from rapid industrial expansion, which required, along with capital and labour, significant input of land upon which factories and related infrastructure could be built. The parallel influx of labour into these industrial centers, in turn, has created massive and rapid urbanization. A significant proportion of land converted for these two interrelated purposes has come from cultivated agricultural land.

There is some ambiguity on the exact magnitude of this change but by all counts it is significant. The pace at which arable land is converted has been very rapid especially since 1995 with 5.4 million hectares, or approximately 3 percent of the national total, being lost only during the period between 1996 and 2003 (Lichtenberg and Ding, 2008). Millions of peasant families cultivating have been displaced as their arable land was acquired for urban industrial development. One estimate puts the number of farming families losing their land for alternative uses to 2 million a year (He et al., 2009). Land conversion of this magnitude has escalated social tensions, often leading to violence. The government response has ranged from rehabilitation and compensation packages for the displaced peasants to administrative measures for forcibly putting down social unrest (Su, 2005).

The coastal provinces of Guangdong, Jiangsu and Zhejiang as well as the areas surrounding the urban districts of Beijing-Tianjin and Shanghai are some of the most prominent examples of conversion of arable land to industry. In this section, the paper focuses on the Beijing-Tianjin-Hebei (BTH) region, one of the most prosperous as well as fast growing areas in China located along the northwestern coast, to better explain the mechanisms behind this process and to discuss its impacts.

The BTH region is comprised of the two municipalities of Beijing and Tianjing which are under the direct administrative control of the central government as well as the Hebei province. Through the 1990s the BTH region grew at an astonishing rate of 12.2 percent per year, more than doubling the regional GDP (Tan et al., 2005), a trend that continues into the 2000s. A significant portion of the region has been urbanized in the last two decades including the areas around the mega-cities of Beijing and Tianjing as well as

those around other urban centres of Hebei province. It also constitutes one of the three main industrial belts in the country contributing more than 10 percent of the national GDP in 2009. Along with its industrial importance, the region has also been a significant agricultural producer with 17.5 percent of its regional domestic product coming from the primary sector in 1990. However, in the two decades since then, this percentage has come down to a mere 6.7 (NBS, 1991, 2009) showing a marked structural change with a decreasing role of agriculture in the regional economy. This process is accompanied by a corresponding change in the allocation of resources including labour and land.

According to a study carried out on the basis of remote sensing data (Tan et al., 2005), the BTH region has seen an extraordinary increase of 71 percent in its urban area between 1990 and 2000. Beijing's urban landscape more than doubled in the same time period. About three-quarter of the addition to urban land was due to the conversion of cropland. A study covering the Eastern coastal provinces (including the BTH) for the period 1996-2005 reports that the rate of arable land loss picked up by more than 400 percent in the period 2001-2005 in comparison to the earlier five years between 1996-2000 (Yansui et al., 2008). Specifically for Hebei province, the most agriculturally active area in the BTH region, the land loss in the 2000s was almost 10 times that in the later half of the 1990s. Beijing also lost huge tracts of arable land between 2001-2005 due to an urban sprawl resulting from the infrastructure development related to the 2008 Olympics.

The trends discussed above are indicative of a shift which is now extended to parts of China beyond the coastal provinces. During this process, millions of peasants have been dispossessed from their agricultural land and have joined China's urban industrial labour force. They have not always been adequately compensated or appropriately rehabilitated (Su, 2005). Peasants who have been displaced have rarely found employment in the new sites of production that occupy their lands, forcing them to join the ranks of China's vast army of internal migrants.

As is the case with any other major socio-economic phenomenon, the Chinese state has been inextricably linked to the process of land conversion since the pre-reform period of 1978. In the pre-reform period, most land was collectively owned at the local level. There were multi-year development plans at the central and the local government level with specific growth targets. When land was required for industrial or infrastructure development in conjunction with the plan targets, the local government acquired land from the farmers and allocated it for its intended use. The farmers were mostly compensated with non-agricultural jobs in state owned enterprises and often offered an urban residency status (hukou) which came with an attractive package of social services which were not available to rural residents (Ding, 2007).

After 1978, a process of de-collectivization started restoring a peasant-based egalitarian agricultural system with some safeguards for intergenerational demographic change (Griffin, 1984). While the actual ownership of agricultural land still rested with the village collective, it was leased out to individual households under the Household Responsibility System (HRS) thereby granting them long-term user rights. As we have noted above, the process of

land conversion intensified in this period with high rates of economic growth and urbanization. The institutional set up for administering land conversion changed substantially with the formulation of the Land Administration Law (LAL) in 1986 (with major amendments in 1998 and 2004) that provided guidelines for land acquisition from farmers for conversion to non-agricultural use. The LAL contained detailed provisions regarding compensation of farmers who lose their land as well as some measures to help their rehabilitation in alternative sectors. The compensation was initially fixed between 3-6 times the annual values of output. In subsequent amendments, this went up to 6-10 times of the annual value of output (Ding, 2003; 2007). Along with the LAL, another important legislation in the area of land conversion and development was the Basic Farmland Protection Regulation of 1994. In face of the fast depletion of cultivated land in the previous decade, the Farmland Protection Regulation was put in place to check the rampant conversion of prime farmland and maintain China's self-reliance in food production. The regulation prohibited the acquisition and conversion of certain categories of prime agricultural land for non-agricultural use.

The process of land conversion has been far from smooth. The popular response to agricultural land conversion and acquisition has ranged from willing acceptance to violent resistance. In recent times public demonstrations and protests related to forced land 'takings' have reached a new high (Zhu and Prosterman, 2007). There have been frequent reports of public outrage related to land disputes in the form of violent clashes with police or the land mafia¹. In the pre-reform period before the advent of the HRS, the sense of individual entitlement on land hardly existed. Therefore the sense of loss for having to give up land was minimal. Moreover, such moves often came with the opportunity of an urban job with associated benefits for the farmers.

The situation changed fundamentally after the HRS established a deeper connection of peasants with their allotted land. Although provisions for compensation as well as resettlement were enacted through the LAL, there were several reasons for discontent regarding land acquisition or expropriation. First, the individual peasant whose land was being acquired has little say in deciding about the industrial or infrastructural projects that necessitated land conversion. Technically, rural land including farmland is owned by the local collective at the village level and decisions about land acquisition finally rest with this collective. But since the local governments merely represent the local population and are not constituted by it, there are always possibilities of perverse incentives for the local authorities to enter into deals that serve narrow interest of the leaders and not that of the entire population. Second, there is a common grievance that the compensation paid for expropriated land is not enough for rehabilitation. Typically six to ten times the annual value of production was paid as compensation. However, given the artificially depressed price of agricultural produce, the compensation amount might fall way short of the market value of the plot of land. Third, even the amount fixed

¹ See for example a news report on the violent incident in Shengyou village in Hebei province in 2005 in which 6 villagers were killed resisting an armed group sent to force them out of their own land (<http://www.terraily.com/news/china-05zzzt.html>).

as compensation is not entirely received by the individual farmers. Ding (2007) reports how in the case of land acquired for a project outside an Eastern coastal city, farmers received merely 26 percent of the total land development benefits while the rest were shared by the city government, the village government and the central government. Studies discuss the fiscal interests that the local governments have in pushing forward land procurement deals sometimes in detriment of the farmers' interest (Man and Hong, 2010).

3.2 Sloping Land Conversion Programme

Conversion for urban industrial development is not the only process through which land has been taken out of agriculture. A large and ambitious afforestation programme in China's central and western regions has also resulted in more agricultural land being converted. The roots of this programme can be found in the massive draught of 1997 and devastating floods in 1998 along the Yangtze river that killed over 3000 people and caused massive damage. Upstream deforestation emerged as the primary explanation used by governmental agencies to account for these disasters, prompting the central government to draw up an ambitious plan to increase the forest cover along with the conservation of the existing forest land. The Grain for Green programme (GFG) or the Sloping Land Conversion Programme (SLCP) was started in 1999 as a pilot project and was extended across the country by the end of 2002. The main objective was to provide incentive to farmers in the highly sloped areas of the Yangtze and Yellow river basins to set aside part or whole of their agricultural land for forestry purposes.

According to official plans of the GFG programme, 14.7 million hectares of farmland are scheduled to be converted to forest between 1999 and 2010 (Yue et al., 2010). This conversion will affect an estimated 50 million households (Uchida et al., 2007). The programme also has a 'soft target' of afforesting an equal area of wasteland. Structural adjustment of China's land-based economy (Demurger et al., 2009), poverty reduction (Xu et al., 2010) as well as safeguarding water resources and promoting sustainable development (Peng et al., 2007) are other objectives of the programme. The GFG is the largest cultivated land set-aside program in the developing world and also has organic links with other major interventions in China's inland provinces, most importantly the Great Western Development Plan. It was formulated and implemented at a time when China was producing a major surplus of foodgrains (Xu et al. 2010) and, given the healthy state of the economy, had the funds required to run a programme as large as the GfG (Liu et al., 2008). In the first four years (1999-2003), almost 35 billion RMB was spent on the programme.

There is a specific slope threshold for land to be included in the programme. It is 25 degrees in South-West China and 15 degrees in the North-West. By targeting high slope areas, which are characterized by lower productivity, it was expected that loss of grain production would be significantly minimized. However, there are inconsistencies in the way these thresholds are applied and there is evidence that local authorities exercise considerable discretion in including areas for conversion. Given the vast financial resources harnessed for this program by the national government and

the limited resources controlled by local governments, the latter have seen the GfG as a potential source of much needed financing and hence has aggressively earmarked land for the project (Xu et al., 2004). Nevertheless, Yin et al. (2005) report that there is a negative correlation between the productivity of plots and their likelihood for selection indicating that implementation followed the guidelines relatively closely.

The GfG was designed as an incentive based voluntary programme where the decision to participate or not rests with individual farmers whose land meet the criteria for conversion. By appealing to individual incentives and combining them with market forces, the GfG is an important break from past practice. However, there is uncertainty regarding the precise mechanism through which participants are selected. Although in principle, participants self-select themselves, Bennett (2008), suggest that participation is decided by local government officials. Only 62 percent of the participating households interviewed for a survey in 2003 report that they had autonomy to decide on their participation. Only 30 percent had a choice about the specific plots that they wanted to retire under the programme (Xu et al., 2010).

The state policy of implementing the GfG project requires that peasant incomes must not decrease after the conversion of cultivated lands to forestlands or grasslands. (Peng et al., 2007). Three types of payments or subsidies are given to the peasants: in kind payments of grains to replace lost production, annual cash payments to help with the process of transition and free seedlings at the time of planting. The length of the payments depends on the type of conversion. 'Ecological forests', which are timber-producing forests, will be supported for 8 years. 'Economic forests' on the other hand, will be supported only for 5 years but the peasants are allowed to harvest non-timber forest products. In addition, there was also a conscious aim to move a section of the farmers away from crop production and provide them with alternative means of livelihood through livestock rearing and other off-farm work (Xu et al., 2004).

As a programme, it is difficult to accurately characterize the nature of the GfG. On the one hand, it makes use of 'payments for ecosystem services' (PES) type of intervention, which can be read as evidence of a new phase in Chinese environment and development policies (Xu et al., 2010). Specifically, while such policies are often executed in a top-down fashion through large-scale campaigns that mobilize the citizens to fulfill goals set by central planners, the PES approach is generally considered to be a market-based policy that requires relatively low levels of state involvement beyond initial design and set-up. However, despite the prevalence of monetary incentives that follow the PES model, the evidence suggests that the GfG "appears to be in practice just another in a long line of topdown, campaign-style programs implemented by China's central government" (Xu et al., 2010: 241)

While the environmental impact of the GfG in terms of the increase of forest cover and the prevention of soil erosion is largely positive, the evidence on the socio-economic impact is mixed. A study based on survey data from three provinces in which the GfG was first implemented, namely Sichuan, Shaanxi and Gansu, finds that participants have gained significantly in terms of their income from livelihoods compared to the non-participants. At the same

time, predictably, crop income has suffered a significant fall. The effect on the total income was ambiguous (Uchida et al. 2007). Interestingly, the labour allocation in terms of employment in the off-farm sector did not show any significant change. In terms of food grain production, the effect of the programme has been shown to be quite small. The impact on price is also non-existent (Xu et al., 2006).

No comprehensive data is available on the impact of the programme over the entire period since its inception. Existing studies focus almost exclusively on technical assessments of the efficiency and efficacy of the GfG project, analyzing a variety of indicators that dovetail the technician mindset behind such megaprojects (see, among others Chen et al., 2007). Whereas many studies have assessed the ecological and socioeconomic effects of the GfG they are mostly scattered, fragmented, and short-term.

Overall, the available evidence suggests that—at least according a narrow set of considerations—the program has been successful. However, concerns remain about its long term viability, partly because of the survival rates of trees, which have been lower than expected in certain areas (Bennett, 2008), and partly because there is fear that peasants will revert back to farming upon the termination of the support systems. Moreover, the tension between the environmental and economic goals of the programme poses questions about the long-term viability of the GfG. In this context, it has been argued that “the stated dual goals of poverty alleviation could be adversely affecting the program’s environmental efficiency, since it could be allowing local leaders to selectively deemphasize the program’s environmental goals when these prove difficult to obtain” (Bennett, 2008). Nevertheless, the program has been extended for 2-8 years at the cost of another 210 billion yuan (Liu et al., 2008).

3.3 Wasteland reclamation²

A counter trend of land use change relates to the reclamation of arid lands in China’s border provinces. In provinces such as Heilongjiang, Inner Mongolia, Gansu and Xinjiang, a process of converting what has been termed ‘wastelands’ has long been at work. Such conversion, however, has vastly intensified since the establishment of the People’s Republic in 1949. Between 1979 and 1995, more than 11 million hectares of land has been added to China’s stock of arable land through wasteland reclamation with much of this increase coming from the provinces above (Ash and Edmonds, 1998). The case of Xinjiang is emblematic of the goals, means and outcomes of wasteland reclamation in contemporary China. Covering one sixth of China’s landmass, Xinjiang is the largest political unit in the country. Testifying to its remote, borderland status that makes it a neighbor to Mongolia, Pakistan, Kazakhstan, Tajikistan, Kyrgyzstan and Kashmir, its name literally translates as ‘New Frontier’. At the time of the Chinese revolution, the population of Xinjiang

² The research underlying this chapter is part of the project Changing Livelihood Strategies in Rural Xinjiang: Cotton Production, Environment and Poverty Reduction (Project Nr. 07CDP028; 2007-10), financed by the Royal Dutch Academy of Sciences (KNAW), in cooperation with the Xinjiang Agricultural University, with support from the Nanjing Agricultural University.

was 90 percent non-Han, with Uyghurs, who are Muslims and speak a Turkic language, making up the majority of its 12 minority groups.

The vast expanse of mostly arid land in Xinjiang has been the object of plans for agricultural expansion at least since the Qing dynasty. These plans have been systematically put into place since the 1950s, creating an ambitious yet largely unspoken project of land reclamation and population resettlement. While concrete data is difficult to obtain, the project's impact is most easily seen in population figures (Spoor and Xiaoping, 2009). In 1953, the population of Xinjiang was under 5 million with the Uyghurs comprising approximately 75 percent. By 1990, the total population had grown to just over 15 million with the Uyghur population making up 47.5 percent. The remarkable growth of Xinjiang's Han population from 300,000 in 1953 to 6,500,000 in 1995 is a testament to the scale and effectiveness of this program. While a significant portion of this new population have settled in urban centers such as Urumqi and Korla and work outside the rural sector, irrigated land reclamation has been a major driving force in attracting Xinjiang's new population.

Land reclamation began with the process of demobilizing the People's Liberation Army based in the province. A significant proportion of these soldiers, which were there to 'liberate' Xinjiang and its predominantly Uyghur population from its 'feudal' system, were settled into the region to work for the Xinjiang Wilderness Reclamation Army. Following the completion of their military task, the military personnel were kept in Xinjiang to continue reclaiming arid land and expand agricultural production. These new farmers were then brought under the control of the Xinjiang Production and Construction Corps (XPCC), which began to operate the bingtuan farms, otherwise known as regiment farms or state farms. Similar processes were put into practice in other frontier provinces such as Heilongjiang and Inner Mongolia.

While most commentators on Chinese agriculture and particularly those working with Xinjiang and the larger western region agree that "[e]ven the simplest statistics (such as the total number of state farms) have enough discrepancies to vex the researcher" (Woodward, 1982) and that there are "inherent difficulties in using official data", Shen and Lei's figures on opened up wasteland is worthy of replicating here:

TABLE 1
Opened up wasteland in Xinjiang 1950-1990

| | 1950-57 | 1958-60 | 1961-1967 | 1968-1976 | 1977-1990 | Total |
|---------------|---------|---------|-----------|-----------|-----------|---------|
| Total (ha) | 743000 | 1300300 | 895900 | 670000 | 34700 | 3956600 |
| Bingtuan (ha) | 303900 | 564600 | 247400 | 114200 | 154100 | 1384200 |

The most recent phase of land reclamation in Xinjiang is most accurately discussed within the context of ongoing economic changes in China and their ramifications for landlocked western areas that have long been comparatively poorer than their coastal counterparts. The impressive pace of China's economic growth since the 1980s has not helped the conditions in Xinjiang and the rest of western provinces, since the development strategy pursued by

the state focused explicitly on creating industrial development in coastal areas. This resulted in the further intensification of the regional socioeconomic differences, prompting the authorities in Beijing to develop a plan to tackle it. This ambitious project has been called the ‘Great Western Development Strategy’ (XibuDaKaifa) and is also often referred to as the ‘Open Up the West’ campaign (Becqueulin, 2004). In addition to Xinjiang, which is claimed to be its most important component (ibid: 364), it involves several other provinces such as Tibet and Gansu that together comprise most of the poorest and landlocked parts of China.

Shen and Lei assert that the period since 1991 has seen further opening up of wastelands, though at a slower pace. During this period, private companies too have joined the reclamation efforts, though there is no available data on the amount. According to ‘Land Use Overall Plan of 2010 to 2030’ prepared by counties (xian) and regiments (tuan), there are further plans to reclaim land in the region. These plans, in turn, fall within the larger ongoing XUAR-wide effort to boost the region’s production of cash crops through initiatives such as the ‘6311’³ plan that sets ambitious targets for the increase of the region’s production of almond, jujube, apricot, etc. (Spoor and Xiaoping 2010). According to policy makers in Xinjiang, the goal is to ‘export’ these products to the rest of China, where Xinjiang’s fruits are renowned for their quality, as well as to the outside world. While there is no data to confirm whether the XPCC continues to perform land reclamation at a large scale, evidence from a recent survey conducted by a team of researchers that include the authors suggests that for Uyghur peasants who seek to expand their land size, reclamation remains an important option. The expanded and improved irrigation network being built as part of the ‘Open Up the West’ campaign makes such expansion a realistic possibility by increasing the supply and reach of water into what is otherwise an extremely arid region. Overall, data from official statistics show that that cultivated areas in Xinjiang have increased from 1,209,700 hectares in 1949 to 41,245,600 hectares in 2008. The available data suggests that approximately 90 percent of this area is irrigated. The Chinese government has recently announced potential plans to divert seawater from eastern provinces to Xinjiang in order to continue supplying water for the draught-stricken region so that economic development can continue unabated (China Daily, November 9 2010).

This dramatic increase in irrigated cultivated land has been made possible by the reclamation of vast tracts of land identified as ‘wastelands’, which refer to a variety of arid landscapes that are not economically productive for agricultural development (Shen and Lein, 2005). This does not necessarily, mean, however these lands are without value economically, culturally, or socially. Rather, their natural state does not lend to intensive agricultural production. By designating them as ‘wastelands’, Chinese authorities have historically opened up these areas for dramatic transformation. In Xinjiang, this process was particularly pronounced in the post-1949 era, where it was

³ The figures in ‘6311’ refer to the total amount of land planned for the expansion of the cultivation of certain types of crops, i.e. 600,000 mu of almond, 300,00 mu of apricots, 100,000 mu of walnuts and 100,000 mu of other fruits (Spoor and Xiaoping 2010).

believed that the “earth could be transformed through ideologically motivated determination” (Shapiro, 2001: 197) in “Mao’s War Against Nature” (ibid.) The technocratic and technicist approach to nature-society relationships has also continued into the contemporary period and the management of deserts and arid areas are primarily “contextualized in a discourse of modernity” (Williams 1997: 344), which juxtaposes the Han-dominated modern China against the practices of ‘primitive’ ethnic minorities populating the ‘wastelands’ in remote areas.

Overall, the policy of using water diversion and irrigation projects have historically served a number of interrelated goals. One goal has been the ‘Sinicization’ of Xinjiang by the introduction of the dominant Han nationality of China. This, in turn, has been justified in terms of the strategic significance of the region, which is manifold. During the 1950s, Xinjiang was literally the frontier area during a time where considerable tension existed between the USSR and the People’s Republic. The region’s rich oil, gas and mineral deposits have also contributed to its importance for Beijing and, given the breakneck speed of development taking place since the 1980s, this dimension has gained further import. Similarly, that the region was predominantly populated by a Muslim minority has historically contributes to its perception by national policy makers as being a sensitive area that necessitate a firm grasp from the centre. The events of 11 September 2001, however, have not only lent more fuel to such arguments but have also been used by the central government to justify increasingly authoritarian measures. These seem have increase manifold since July 2009, the latest episode of tensions between the region’s Uyghur and Han populations that resulting in widespread violence.

The ethnic-religious dimension of Xinjiang has long been a staple of research on China’s autonomous regions (Gladney, 2004; Bovingdon, 2004; Becquelin, 2000; 2004). What has been missing, however, is closer scrutiny of the agrarian significance of the ongoing economic, demographic and ecological transformation of the region. In other words, while traditionally-defined strategic concerns – expressed through the tropes of sensitive borders, rich natural resources, and combustive mix of ethnic and religious characteristics of minorities – seem to have guided both national policies and resulting political economic transformations, the resulting change in agricultural patters and practices too have salience to understanding the future of China’s development.

4 Interpreting divergent land use changes and the role of the state

The disparate processes of land use change taking place in China have come under increasing scrutiny in recent years. This otherwise sound literature has two major shortcomings. On the one hand, these processes have all been handled primarily as isolated phenomenon and their connections to each other as well as how they fit within the larger process of structural change in Chinese economy have remained unexplored. On the other hand, the impact of these processes have received a similarly narrow treatment with most studies focusing on single indicators of change, such as area of land under cultivation

or amount of food grains produced. While such studies are indeed relevant and necessary, their fragmented view of land use and its changes over time in China obscures the impact and significance of such changes. For example, Deng et al. use satellite images to claim “that between 1986 and 2000 China recorded a net increase of cultivated land (+1.9%), which almost offset the decrease in average potential productivity, or *bioproductivity* (-2.2%). Therefore, we conclude that conversion of cultivated land has not hurt China's national food security” (2006: 372).

While ‘total area of cultivation’ might stay relatively stable as suggested above, the data presented in this paper shows that, through distinct processes, land use change is taking place intensively as land is moving in and out of agriculture. This movement of land, in turn, is having significant impact on the location, composition and well-being of population as well as implications for sustainable land use. For instance, over the past fifty years, millions of idealistic youth from China’s urban centers were transferred into Xinjiang to populate newly opened agricultural plots (Shapiro, 2001). Similarly, the ongoing ‘Grain for Green’ program is forcing hundreds of thousands of farmers, especially those who make up the younger strata of society, to leave agriculture and look for employment either in regional rural industry or, as is more often the case, in urban industrial jobs in China’s booming coastal cities (Liu and Wu, 2010). Thus, by focusing entirely on net changes in an aggregative sense, we miss out on the severe impact on rural populations that result from the different movements of land. Vast numbers of households and their livelihoods are affected in each case, implying a major change in the structure of employment. Peasants who lose their land due to industrialization or infrastructure construction or are ‘strongly encouraged’ to retire their plots for ecological sustainability, do so with significant costs for which they may not be compensated appropriately. To this end, it is possible to argue that focusing exclusively on aggregate sums – be it total area of arable land or total amount of production of grains – makes an implicit assumption that ‘land here is the same as land there’. The three processes described in the previous section show that such an assumption is incorrect as it obscures the environmental, social, political and structural economic implications of land use change in China.

Taken together and juxtaposed against the structural change literature, it is necessary to interrogate the precise machinations behind these movements. Such an inquiry is necessary both for appreciating the precise role of land in transition and development but also for understanding the root causes of the socioeconomic and environmental impacts they impart. The literature on structural change, as with much of development theorizing, implicitly or explicitly assumes this transition of land – from agriculture to industry – and population – from rural peasants to urban industrial workers – to be as necessary as it is inevitable. This perceived inevitability itself arises from the assumption that there is a ‘natural’ trend of development that carries societies from being traditional and agrarian to modern and industrial. Thus, analyses that are built around the putative naturalness of this transition frequently obscure the role of the state in managing both the pace and direction of the process of development and its specific implications for land use (Marton, 2000).

The three processes taking place in China demonstrate the paramount role played by the state in orchestrating land use change of various types. This is at its clearest in land reclamation in Xinjiang and the rest of border provinces where, historically, but especially since 1949, the state has actively been executing a planned and well-funded process of creating new land for agricultural development. The creation and continued existence of the regiment farms clearly shows that the role of the state here is more than acting as a 'spark' to unleash a certain type of economic development. Rather, the central government has followed a series of long term development projects – the Great Western Development Strategy (Lai, 2002) being the latest example – in which agents controlled or directed by the state create new land and ensure the creation of a new agrarian population to go with it but also chart the precise nature of agricultural production taking place. In addition to contradicting the presumed 'naturalness' of transition, the heavy involvement of the state also highlights two further challenges to the narrative of linear land use change. First, conventional theory does not anticipate the 'creation' of such vast tracts of land out of 'wastelands' because transition is expected to imply the movement of arable land to industrial production. Second, the transfer of population from urban industrial (or industrializing) areas into newly created centers of agricultural production goes against the notion that development follows a pattern in which peasants are gradually relieved of their land and absorbed into urban industrial production processes (Akram-Lodhi and Kay, 2009). In effect, the example of Xinjiang and other border provinces shows a process that goes beyond repeasantization.

Similarly, the 'grain for green' program evinces another land use change that defies the conventional logic of agriculture to industry. The transition from agriculture to ecosystem services production clearly defies the core assumptions of structural change literature since it simply does not take into account the environment in general and the specific economic value created by ecosystem services in particular (Janicke, 1990). Once again, not only the direction of transition is novel but also the nature of the transition is far from being natural. Just as the reclamation process has been created, designed, executed and managed by central government authorities, the grain for green program was delivered at all its stages from above. The transition of rural populations too defies the predictable narrative. While some peasants whose lands have been forested have indeed sought work in rural and urban industrial sectors, many that remained have transitioned from being agrarian producers to environmental stewards, managing not agricultural production but ecosystem service provision. Attempts to create a market for such services notwithstanding, the current state of the livelihood of these new 'producers' can only be maintained by extensive state funding and involvement.

Upon close inspection, even the most traditional seeming transition discussed in the context of the BTH area, where rural and peri-urban land has been absorbed by industrial and infrastructure development, contradicts the narrative of a natural transition. In such contexts, the process of dispossessing the rural workforce has been steadfastly managed by municipal governments that have acted essentially as land brokers for large-scale industrial producers. Their efforts have, in turn, been supported by the central government that has created the groundwork for such developments to take place by creating and

maintaining cutting edge infrastructure development programs in China's coastal regions that include the construction of roads, airports and ports. Once again, this state-led and state-managed transition defies the simplistic assumptions of the structural change literature in more than one way. Not only the evidence shows significant state involvement but also that the peasantry uprooted from land does not immediately or automatically become absorbed by industry. Rather, many are pushed into further poverty and are forced to become part of the urban informal sector, a category of production that the development studies literature continues to treat as a short-term aberration despite mounting evidence to the contrary.

In short, the state in China is actively managing the process of structural and associated land use change in several distinct ways. First, the state is actively determining when and where land moves both from and into agricultural production in an effort to maintain a supply of arable land that is perceived to be necessary for the purposes of food security. Second, the state is actively pushing for increased (or revitalized) ecosystem service production required to maintain environmental security for China's socioeconomic welfare. Finally, the state is actively encouraging and managing the transition of areas of its own choosing from agriculture to industry. In all three processes which defy the natural, linear and unidirectional narrative espoused by the structural change literature, the state is thus directly implicated in not only the economic outcomes but impacts experienced by various groups of populations that have been actively transferred from being urban workers to peasants, peasants to environmental stewards or peasants to industrial laborers or informal workers.

5 Conclusion

This paper has provided a synthetic account of three major processes of land use change in China. In so doing, it has shown that though land use change is an important underlying dimension of the massive structural transformation accompanying China's explosive economic growth, the dominant theoretical literature on structural change is not cognizant of this fact. By discussing three major processes of land use change, the paper also argues that the processes are indeed of great significance in terms of their scale and their impact on human and environmental well-being. In addition, the existing literature on China's changing land use outcomes is not capable to adequately understand this impact in a holistic fashion as it primarily focuses either on narrowly defined programs or case studies or on meta-analyses of aggregate data. While the first perspective cannot help build a comprehensive picture of the impact of land use change in China, the latter has the effect of obscuring its impacts that arise from the movement of both land and people between various uses and occupations. Because of these shortcomings, existing analyses treat land in diverse states and locations as fungible, thus obfuscating the full impact of changes in land use. Finally, the paper argues that contrary to the implicit understanding of structural change literature and indeed development theory, the transition of land in China between its uses defies the dominant linear and unidirectional narrative. The three processes discussed here show that land–

and population dependent on its livelihoods on these lands—move in different directions and purposes and these movements are shaped and determined by state vision of progress and development.

Taken together, these insights have implications that extend beyond China. Clearly, the opening up of new lands for agriculture as well as for ecosystem service production have parallels in many other developing country contexts. For example, the fast emerging critical literature on land grabbing (Borras and Franco, 2010; Zoomers, 2010) show that control over land for the purposes of food production by extending the agricultural frontier deserves closer scrutiny as it continues to expand internationally. The policy implications of such developments are further complicated by a growing awareness to recognize the monetary value of ecosystem services, which, while contributing to the health of the planet at the global level, are threatening the livelihoods of millions of peasants around the world. Just as in the case of land grabbing, a critical policy discussion needs to be had regarding the trade-offs facing the international community in choosing between the visions of ‘strong’ versus ‘weak’ sustainability (Ho and Lin, 2003). Finally, the discussion presented here makes a contribution to long-standing debates regarding the future of peasantry. Rather than simply disappearing or ‘reappearing’ by lack of choice, the evidence in China shows that new peasantries are actively being created in new lands.

As many other countries—both those classified as ‘emerging’ economies and also those in the category of the ‘next 11’ – are going down a similar path of rapid industrialization led development, the insights emerging from China are of paramount importance in anticipating the impacts of structural change on human and environmental well-being. Within this context, it is also important to re-emphasize one of the central arguments of this paper, namely that this process of structural transformation is neither ‘natural’ nor ‘teleological’ and that it is managed and directed by the state. To this end, the re-emerging debate in development studies regarding the fundamental role of the ‘developmental state’ (Ha-Joon Chang, 2010) stands to make a welcome contribution to debates on land use and structural change as well.

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