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# Subsidies and distortions in China's agriculture: evidence from producer-level data\*

Jikun Huang, Xiaobing Wang, Huayong Zhi,  
 Zhurong Huang and Scott Rozelle<sup>†</sup>

Concerned about national grain self-sufficiency and rural household incomes, in 2004 China announced that it was planning to reverse its longstanding policy of taxing farm households and instead began to provide them with subsidies. Over the past five years, annual announcements have trumpeted rises in subsidies. Surprisingly, despite the historic turnaround of policy and the likely implication of this subsidy policy to China's grain economy, there has been no household-level survey-based research that has sought to understand the effect of China's subsidy programme on household behaviour. Using data from a national survey of more than 1000 households, we examine in detail a number of different dimensions of the subsidy programme. According to the survey-based findings, we have shown that although agricultural subsidies per farm are low, on per unit of cultivated area basis or total amount of budget, the subsidies are high. Almost all producers are receiving them. Subsidies are mostly being given to the land contractor, not the tiller. Most importantly, the subsidies appear to be non-distorting. No matter if we look at descriptive statistics in tables, scatter plots or regression analyses, there is no evidence that grain subsidies are distorting producer decisions in terms of grain area or input use decisions.

**Key words:** agriculture, China, distortions, subsidies.

## 1. Introduction

Observers have reported widely about the discontent of China's rural populations, not the least because of the heavy burden of fees and taxes before the early 2000s (Esarey *et al.* 2000). Village leaders were required to finance most local public infrastructure as well as their village's operating budgets with the fees assessed on villagers (Liu *et al.* 2009). Local governments in many areas imposed heavy tax burdens on farmers (Tao *et al.* 2004). In some villages, poor households paid more than 30 per cent of their annual earnings in fees and taxes.

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<sup>†</sup> Jikun Huang, Xiaobing Wang (email: xbwang.ccap@igsnrr.ac.cn), Huayong Zhi and Zhurong Huang are at Center for Chinese Agricultural Policy, Institute of Geographical Sciences and Natural Resources Research, Chinese Academy of Sciences, Beijing, China. Xiaobing Wang is also at Institute of Agricultural Development in Central and Eastern Europe, Germany. Scott Rozelle is at Freeman Spogli Institute, Stanford University, CA, USA and LICOS, K.U., Leuven, Belgium.

During this time, the government transferred little in the way of fiscal support to the rural economy. Indeed, as late as 2002, the total amount of subsidies targeted to the agricultural sector by the Ministry of Finance (MOF) was only 100 million yuan (MOF 2008). This amount is extremely small given the size of China's rural population. Subsidies to agriculture from the central government amounted to less than 0.007 per cent of the value of agricultural output, only around 0.1 yuan per capita. Most of the subsidies went to enterprises and local government; it is unclear if farmers benefited at all.

After 2003, however, things appear to have changed dramatically in terms of the direction, the quantity and the nature of the payments. In 2003–2005, leaders abolished taxes and fees (Luo *et al.* 2007). In 2004, subsidies to farmers rose to 14.5 billion yuan (MOF 2005). By 2005, instead of the net flow being from rural households to the government's fiscal coffers, the flow reversed. Between 2004 and 2008, subsidies from the MOF to the agricultural sector rose by more than 2.5 times. In 2007, government subsidies reached 51.4 billion yuan. Between 2007 and 2008, subsidies registered the fastest absolute growth, rising to 95 billion yuan, a rise of 85 per cent in one year (from an already high base). The total local tax and fee bill of farmers was zero. Moreover, according to the MOF, most of the subsidy payments (more than 65 per cent) went directly to farmers, instead of as before, to agricultural enterprises and government agencies. According to government sources, there are four types of subsidy payments, including 'grain subsidy' (in Chinese – *liangshi butie*), 'input subsidy' (*nongzi zonghe butie*), 'quality seed subsidy' (*liangzhong butie*) and 'agricultural machinery subsidy' (*nongjiju butie*). The first two subsidy payments accounted for 82 per cent of total subsidies in 2008.

What triggered this turnaround in the five year period between 2003 and 2008? Policy documents suggest that leaders during the Hu-Wen government period of rule began to increase subsidies for two fundamental reasons (Central People's Government, China, 2008). On the one hand, with the rapid expected rise in demand for a number of agricultural commodities, and a lack of incentive for farmers to produce grain, there were rising concerns about national grain self-sufficiency by the national leaders (Central People's Government, China, 2008). At the same time, policy makers stated explicitly that they wanted subsidies to increase farmers' incomes (for reason of rising rural and urban income gap).

While there has been a number of papers about China's great shift from a taxer of agriculture to a subsidiser (Gale *et al.* 2005; OECD, 2008), there are few papers that seek to understand how the policy works on the ground. Are farmers actually receiving the subsidies? Who is receiving the subsidies? How are subsidies being allocated and given to farmers? Are the subsidies being given in such a way that they are distorting decision making in China's agriculture? As late as 2002, researchers produced analyses that demonstrate that China's agriculture was one of the least distorted large agricultural economies in the developing world (Huang *et al.* 2004). Has the new subsidy policy

reversed this trend? Have national grain self-sufficiency and income support objectives been achieved?

The overall goal of this paper is to answer some of the above questions. Unlike any other paper that we are aware of, in this paper we use a large, nationwide set of household data and seek to understand if farmers are, in fact, receiving the subsidies, which types of households are receiving them, how much they are getting and whether or not the receipt of the subsidies is influencing their production decisions.

To meet this goal, the rest of the paper will be organised as follows. The next section describes the dataset. The following sections use the data to answer the questions of interest. The final two sections analyse in a multivariate framework the impact of subsidies on grain production behaviour and input use, discuss the findings and conclude.

## 2. Data

The data for this study were collected by the authors in a randomly selected sample of 1064 households from 58 villages in 6 provinces of rural China that were selected to represent all of China's major agricultural regions (henceforth, the 2008 China National Rural Survey or the 2008 CNRS).<sup>1</sup> We gathered detailed information on household production activities (including fertiliser use) by plot at the time of the survey (2008) and the sown area of each crop in 2007 and 2008.

Information was also collected on the land tenure of each plot and subsidies received by the households. Because farmers sometimes were not clear about the amount of subsidies which they received during the 2 years (2007 and 2008), we first asked each respondent whether they knew the value of the subsidy or not. If they said no, there was no way to ask the amount. If they knew the amount of the subsidy, they then told us the amount that they received. We tried to get the households to divide the subsidies between grain subsidies and input subsidies. Because in many cases, they could not – especially for 2007 (they often called all of their subsidies 'grain subsidies'), we collected grain subsidies for 2007 and 2008; and input subsidies (when available) for 2008.<sup>2</sup>

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<sup>1</sup> The provinces are Hebei, Liaoning, Shaanxi, Zhejiang, Hubei, and Sichuan. There were four counties per province. Importantly, in China, unlike many countries, since almost every household in rural areas has access to land, a household survey and a survey of farms is almost the same thing.

<sup>2</sup> Although we have only two years of data for subsidies, as long as the changes over time are great enough (which they are – as will be shown below); and as long as differences across space are great enough (which they also are – also as shown below), we should be able to meet our objective of determining whether changes in subsidies are associated with changes in grain area or yields. Although it would be ideal to have data from before the start of the subsidy programme, it is not possible. Farmers have difficulty remembering their current year's subsidy. Pretesting showed that their memory of when they first received subsidies was unclear.

### 3. Subsidies in rural China – policy and facts

One of the difficulties in understanding the impacts of subsidies is that the steps in implementing the policies vary as the policies move from the central government down to the grassroots. According to the policy, the allocation of the subsidy budget is implemented in a three-step process (MOF, 2007 and 2008). First, the total budget that is to be allocated for grain and input subsidies for the whole nation (and on a province by province basis) is determined annually by the State Council. Also, provinces with higher grain production are supposed to receive more subsidies. Early in the year, the total amount is announced and implemented by the MOF.

Step two occurs at the provincial level. At each province, the provincial departments of finance follow a similar approach. They set up an account with the centrally provided subsidy transfers. They then divide the total amount of the subsidy to the counties on the basis of each county's grain production.

The final step of the allocation process is for local financial bureaus (at the county level) to determine a standard or criterion (or criteria) by which the subsidy is passed on to households. Although policy guidelines from MOF suggest that the amount of subsidy received by each household should depend on the area of each household's sown area that is planted to grain, the policy also clearly states that local governments can decide how best to allocate the subsidies to households 'based on the locality's actual situation' (MOF 2007 and 2008). Localities absolutely must disburse to households all of the funds that it is allocated (this part of the policy is non-negotiable). Grain and input subsidies cannot be allocated to enterprises or local governments.

Local governments can give out subsidies based on one or more of the following criteria (MOF 2007): (i) the amount of contract land that a household was allocated in the late 1990s;<sup>3</sup> (ii) actual grain sown area; or (iii) a somewhat antiquated measure, the taxable grain production target during a normal year (in Chinese *jishui liangshi changnian chanliang*).<sup>4</sup> It is obvious that grain production quite possibly could be affected depending on the way that grain subsidies are allocated to farmers by local officials. However, while the types of alternatives that can be used by localities to allocate grain subsidies to households are clear, there is not any information available on what standards local officials actually apply.

<sup>3</sup> In China, contract land is cultivated land that is allocated by the village leadership council (which is the formal owner of cultivated land) to each farm household in the village. Use rights are bestowed on the land contractors. Farmers do not need to pay any compensation for use of the land. At the end of the contract period (which according to the 2003 Rural Cultivated Land Contracting Law is 30 years from 1998), the farm household returns the cultivated land to the village for reallocation.

<sup>4</sup> This last measure is a left over from the time period in China when farmers were responsible for delivering a certain amount of in-kind grain tax to the state grain procurement system. Each individual and locality (village/town and county) was assigned a target called the taxable grain production target in a normal year. Households were assigned *mandatory delivery quotas* (Sicular, 1988). Although this system was discontinued in the mid-1990s and grain delivery quotas was phased out during the late 1990s, localities still have records of each household's 'target'.

### 3.1. The transfer of subsidies to each household

While the criterion (or criteria) for allocating subsidies by local officials to households is unclear, the method for physically transferring the money to households is supposed to be set by policy directive (MOF 2007). In almost all provinces, the subsidy is transferred to each household by the county's Financial Bureau through the banking system. In the initial year, for each household, the government set up a special account in a local bank. Each household is allocated a Current Deposit Book (Card) for accessing the annual allocation of the Agricultural Financial Subsidy Funds. In most counties, county finance bureaus allocate the subsidy funds to the local Rural Credit Cooperative. According to policy, after the funds arrive to the local bank, a notice (for both grain and input subsidies) is supposed to be sent to each household.

The timing of the transferring of subsidy funds to farmers is important. The funds are transferred to farm households near the time when they are making the planting decision and not at the end of the season when they are marketing their crop. This is not a price subsidy *per se*. The price that the farmer receives at the time when they market their crop is a market determined price (Huang *et al.* 2004).

### 3.2. Grain and input subsidies in China – an empirical description

Most households in rural China are receiving a subsidy from the government. Indeed, according to our data, by far most households reported that they had received a grain subsidy. Out of our sample of 1064 households, 893 households (or 83.9% of households in our rural China sample) reported receiving grain subsidies. This means, of course, that most people in rural China are benefiting from the subsidy programme.

In addition, there is evidence that the poor are benefiting from the subsidy programme. If we divide our data in a way in which we can compare households with assets below the median level (the 'poor') with those with assets above the median (the 'rich'), we can see that there is no difference between the poor and the rich in the share that received subsidies. Importantly, when looking at each province, there is also no pattern that shows that the poor are not benefiting. In the case of three provinces (Shaanxi, Sichuan and Hubei), the differences between the subsidies received by the poor are statistically indistinguishable from the subsidies received by the nonpoor. In the case of Liaoning and Zhejiang, the poor receive more than the nonpoor; only in the case of Hebei do the poor receive less than the nonpoor.<sup>5</sup>

<sup>5</sup> In fact, the statistical differences between poor and nonpoor disappear completely when examining the differences between poor and nonpoor within counties. In all 24 counties of our study (four counties per province times six province), there is no statistical difference between the subsidies received by the poor when compared with the nonpoor.

**Table 1** Number and share of household respondents that self-reported that they 'did not know' the value (or could not estimate the value) of their 'Grain' ('Input') subsidy across provinces, 2008

	Know grain subsidy	Do not know the value of grain subsidy		Know input subsidy	Do not know the value of input subsidy	
	No.	No.	%	No.	No.	%
Total	893	102	11.4	263	42	16.0
Hebei	188	25	13.3	31	9	29.0
Shaanxi	151	11	7.3	23	4	17.4
Liaoning	172	3	1.7	27	4	14.8
Zhejiang	97	31	32.0	19	5	26.3
Sichuan	139	2	1.4	121	2	1.7
Hubei	146	30	20.5	42	18	42.9

Source: Authors' survey.

While most households knew that they were receiving subsidies, there were some rural households in China that had trouble telling us the *value* of the subsidies that they received. According to our data, 11.4 per cent of households that received a subsidy could not tell us how much the grain subsidy is (Table 1, columns 2 and 3).<sup>6</sup>

There was more confusion in understanding input subsidies. According to our data, only 263 households said that they received input subsidy (Table 1, column 4). This is much less than the 893 households that reported receiving grain subsidies (Table 1, column 1 – which is equal to 83.9% of 1064, the total sample size). According to the MOF's website, most of the households that received grain subsidy should also have received input subsidies. So, why is there a difference between the number of households that report receiving grain subsidies and the number of households that report receiving input subsidies? There are two interpretations. The first is that households that were supposed to get input subsidies did not receive them (while they did receive the grain subsidies). The other explanation is that they received the input subsidies, but they thought they were receiving a higher grain subsidy. In fact, our data support the second explanation. According to the MOF's website, all of the increase in subsidy between 2007 and 2008 should have been in input subsidy; the grain subsidy did not increase. Most households (over 80 per cent) reported that their overall subsidy (or grain subsidy) increased in 2008 over 2007.

<sup>6</sup> During the survey, we did not ask specifically why a particular farmer did not know what the value of their subsidies was. However, it is likely because of the fact that the subsidies were transferred directly to a special, government-initiated bank account, and some farmers do not check the account frequently.

There were 42 of the 263 households (16 per cent) that knew about their input subsidies. However, as in the case of grain subsidies, they also reported that they did not know the value of the input subsidy (Table 1, column 4–6).

Is this noteworthy that households could not tell us the value of their subsidy? The inability to be able to report the value of input subsidies is reminiscent of survey questions (in the 1990s) about taxes and fees. When taxes and fees were deducted from grain sales, farmers often did not know how much they were paying. In the case of subsidies, more than 85 per cent of households said the subsidies were wired directly to their bank account. As discussed in footnote 6 above, there were many reasons that farmers did not know the value of their subsidies. Many just did not bother to check the exact value of the transfer before they had it transferred to their other bank account and it became mixed in with their other savings. Other just forgot.

This is a bit of evidence that input subsidies may not be distorting. The logic of drawing such a conclusion is simple: how can the subsidies be distorting if farmers do not even know how much they are receiving?

So who did not receive grain subsidies? According to Table 2, of the total number of sample households (1064), 85 per cent received a subsidy (which is the 83.9 per cent of the households that claimed they received grain subsidies and 1.1 per cent of the households that claimed that they received input subsidies, but did not receive grain subsidies). This means that 15 per cent of the households reported that they did not receive the subsidies.

Our data show that there are only a few groups of people in rural China that do *not* receive the subsidy (Table 2). First, of the 15 per cent of the households that did not receive a subsidy (row 3), one-fourth of them (or 4 per cent of the total number of households) were those that did not have any contract land (row 4). In other words, in the case of these households, because they did not have any contract land, and because (according to our village level survey) the grain subsidies in these particular villages were linked to the amount of contract land a household had, they did not qualify for receiving the subsidies.

**Table 2** Number and percentage of households that received or did not receive grain and input subsidies in 2008

Row #	Category of household	HH number	%
1	Total sample households living in villages	1064	100
2	• Number of households received subsidy	904	85
3	• Number of households did <b>not</b> receive subsidy	160	15
4	– Household has no contract land	40	4
5	– Household had some contract land, but:	120	11
6	■ All subsidy went to rentor	9	1
7	■ Did not know that there was a subsidy (although cultivated grain)	66	6
8	■ No grain (cultivated their own land)	45	4
9	– No subsidy to any household in village	0	0

Source: Authors' survey.

However, there were 11 per cent of the total number of farmer households in our sample (or 75 per cent of those that did not receive the subsidy) that had contract land, but did not receive a subsidy (Table 2, row 5). This group can be divided into several different types of farm households. Specifically, about 8 per cent of these farmers (or 1 per cent of all farmers) said that although they had contract land registered to them, since they rented out all of their land, they did not receive any subsidy (an issue that will be looked at more closely in the next section – row 6). In addition, about half of these households with contract land (6 per cent of the total), but no subsidy, actually cultivated grain, said that they just did not know about the subsidy (row 7).<sup>7</sup> Finally, and significantly, about 40 per cent of the farmers in this category (or 4 per cent of the total number of farmers) said that they knew there were subsidies and planted grain, but were not eligible for the subsidy (for some reason that they could not enunciate – row 8). This is significant because it shows that there are few farmers that are not getting the grain subsidy because they are not producing grain. Also importantly, there were no villages in our sample in which there were zero households that received subsidies (row 9).

So what about the 20 per cent or so of the other rent-out/rent-in contracts? There is some evidence that at least part of the subsidy is being ‘capitalized’ into the rent. In the case of the rented in plots, the rent is higher (and significantly so) when the tiller/tenant gets the subsidy than when the contractor (rentor) gets the subsidy. Local officials in China, at least so far, appear to have chosen to allocate grain subsidies on the basis of the amount of a farmer’s contract land.

### 3.3. The size of producer subsidies in rural China

The level and the growth rate of subsidies that were going to China’s farming households between 2007 and 2008 increased significantly (Table 3). For the farmers who could report the value of the subsidies, in 2008, the government provided the typical farm household 273 yuan in grain subsidies (row 1, column 4). During the same year, farmers received 169 yuan in input subsidies (column 7). Considering the households who reported having received grain or input subsidy, the typical farmer received 327 yuan (not shown in Table 3). If the average rural household earned 19044 yuan in 2008 (4761 yuan on a per capita basis, assuming that the average household has four members), then 1.7 per cent of household income was from subsidies.<sup>8</sup> Importantly, however, when doing the calculations with the level of income at the poverty line (785 yuan per capita for the extreme poverty line; 1067 yuan per capita

<sup>7</sup> By far most of the farmers in this category were from Zhejiang province, the richest province in the sample. In a number of Zhejiang counties, farmers had to apply to get the subsidy. Many said they were too busy to take the time to do so.

<sup>8</sup> The share of income from subsidies is much higher in the USA and the EU. The major reason is that farmers in the USA and the EU have significantly larger areas of sown area.

**Table 3** Grain and input subsidy reported by households that claimed they knew the amount of grain or input subsidy in 2007 and 2008 (Yuan/household)

Number of sample households	Grain subsidy				Input subsidy			
	Grain subsidy in 2007		Grain subsidy in 2008		Number of sample households	Input subsidy in 2008		
	Mean	Standard deviation	Mean	Standard deviation		Mean	Standard deviation	
Total	718	178	334	273	395	185	169	171
Hebei	119	185	199	300	247	20	189	210
Shaanxi	129	116	108	230	160	17	76	175
Liaoning	166	374	288	512	349	21	31	85
Zhejiang	65	165	871	286	974	3	30	52
Sichuan	133	50	58	56	83	102	229	158
Hubei	106	107	112	182	166	22	91	109

Note: The calculations in columns 2 and 4 are based on the households that claimed they knew the amount of grain subsidy in 2007 and 2008. The calculations in column 7 are based on the households that claimed they knew the amount of input subsidy in 2008.

Source: Authors' survey.

for new national poverty line), if the poor were getting as much subsidies as the average farmers, 10.4 (for the extreme poverty line) or 7.6 (for the new poverty line) per cent of household income would come from subsidies.<sup>9</sup> From this, it is clear that subsidies are having an impact on increasing incomes – especially for the poor.

When looking at subsidies on a per land area basis, it is clear that China is becoming a major subsidiser. Since the average household had 8.4 mu of contract land, this means that they received 39 yuan per mu in 2008. Converting to US dollars (6.8 RMB = 1 dollar) per acre (6 mu = 1 acre), demonstrates that the farmers received 34.4 dollars per acre in 2008. During the same year (2008), the typical farmer in Illinois (a typical Midwest state) received 30–50 dollars per acre. Of course, since the average farmer's land holding in China is only a fraction (1/315) of that of the farmer in the USA, the average per household subsidy is still much lower in China.

#### 4. Are China's subsidies distorting production?

##### 4.1. Descriptive results

The descriptive statistics report whether the households believed/perceived that there was a positive link between their grain production decision and the receipt of the subsidy. For the 850 households that stated that they knew the

<sup>9</sup> The early poverty line was set quite low by international standards (about \$0.75 US in PPP per day) versus the one dollar (in PPP) per day poverty line used by the World Bank. The new poverty line used after 2008 was raised to a level that is nearer the international poverty line.

level of their grain subsidy in 2008, almost half (50 per cent) of the households said that there was no link. This number is even higher if we count the 14 per cent of the households that said that they did not know. One interpretation of these findings is that if the farmer did not know, it could not be affecting their production (sown area) decisions. It means that nearly two-thirds of households that received grain subsidies in 2008 believed that there was not any link to the amount of grain that they produced (or the amount of area that they cultivated).

While the remaining 36 per cent of the total farm household sample is smaller, if the survey was representative of all of China, this would still mean that more than 50 million households believed there was a linkage. It is arguable that there is, in fact, a linkage between the subsidies and grain production. This is plausible if certain localities distributed grain subsidies differently than others (in other words according to criterion (ii), which would link the subsidy to grain production or sown area). It also is possible that farmers did not know.

Interestingly, the data of the 36 per cent of the sample households show that these farmers responded that there is a link but are not saying so based on their own experiences in 2007 and 2008. To show this, we constructed Table 4 using only the subset of households that said that they knew the level of their subsidy and that they believed that there was a link. If this were true then if any part of this group of sample households *reduced/increased* their household's grain sown area, they should have seen their subsidy *fall/rise subsequently*. The results showed that the change in the level of the subsidy between 2007 and 2008 was uncorrelated with the change in sown area (column 1, rows 1–3). Indeed, the average *rise* in the subsidy between 2007 and 2008 was *higher* (51 per cent higher) for households that *reduced* their grain sown area (between 2007 and 2008) than that (38 per cent higher) for households that *increased* their grain sown area (between 2007 and 2008). The same findings appear for more disaggregated groups (columns 2–4).

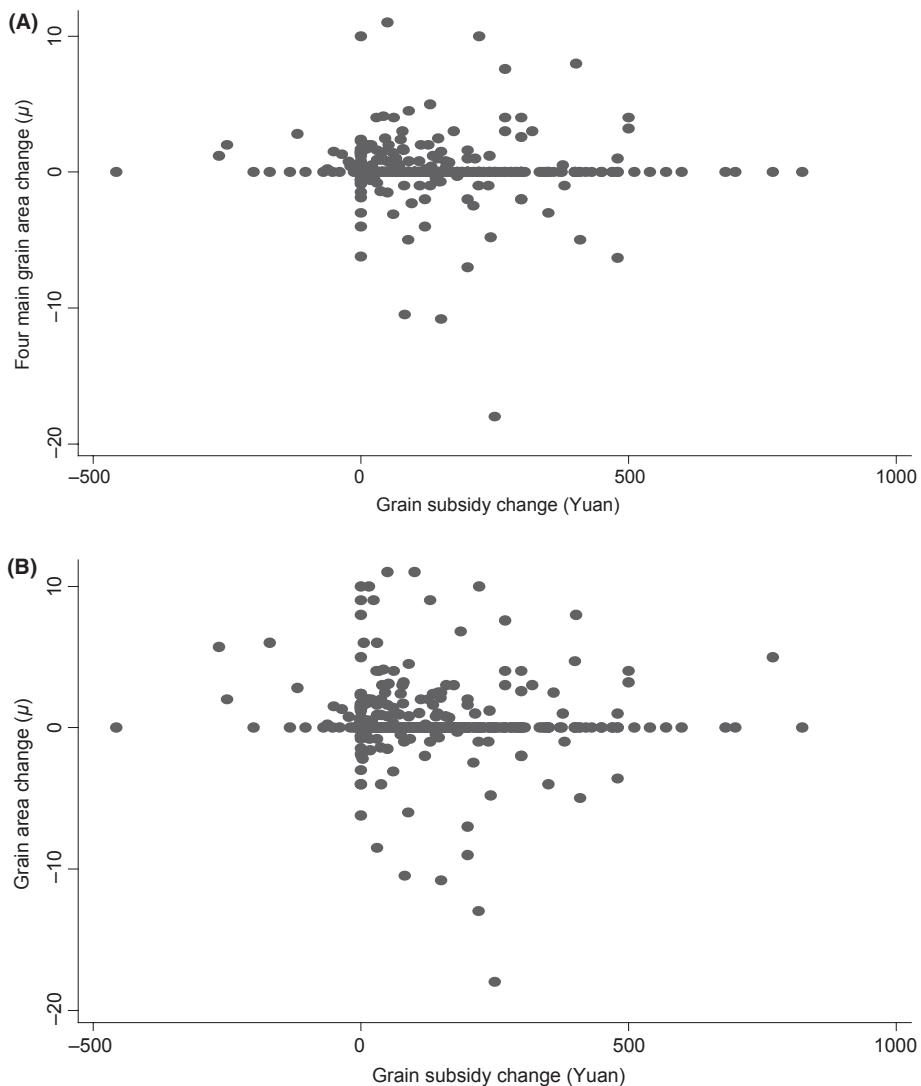
**Table 4** Changes in grain subsidy by the level of grain area change in 2008 over 2007 for those farmer that said their grain subsidy was related to the area of grain planted

Grouped by grain area change	Change in grain subsidy			
	Average	Reduced more than 20%	Changes within -20% and + 20%	Increased more than 20%
Area reduced more than 20%	51	Not applicable	4	77
Area changes within -20% and + 20%	82	-90	5	134
Area increased more than 20%	38	-52	5	86

Note: This table only uses information from those households that were able to estimate (or knew) the amount of grain subsidy in 2007 and 2008.

Source: Authors' survey.

Figure 1, panel A, plots changes in the area sown to the four major types of grains (rice, wheat, maize and soybean) by each farmer-respondent against the change in subsidy and produces a picture that clearly shows no relationship between producer behaviour and subsidies. The same is true when looking at the scatter plot of changes in the area sown to all grains and changes in subsidy (Figure 1, panel B). The same patterns could be shown in the case of fertiliser (although we do not do that here for the sake of brevity). Clearly,



Source: Authors' survey

Note: The calculations are based on the households that received grain subsidies in 2008

**Figure 1** Scatter plots of grain subsidy changes and grain area changes at the household level between 2007 and 2008. Panel A: Four major grain crops (rice, wheat, corn and soybean). Panel B: All grain crops.

those that used higher levels of fertiliser per mu in 2008 did not systematically receive higher subsidies.

Finally, Table 5 and Figure 2 show that there does not seem to be a propensity for local officials to target grain subsidies to those producing grain. Table 5 shows that although most farmers are producing grain, substantial shares of farmers in all provinces do not produce grain. The distributions (by province) of the subsidies per household received by grain producers are almost identical as the distributions of the subsidies per household received by those producers that did not cultivate grain (Figure 2). Statistical tests of the differences between two distributions confirm that there is no statistical difference among any of the pairs of distributions.

#### 4.2. Multivariate analysis

In order to isolate the effect of subsidies on the household grain production decisions of farmers, we can specify the following empirical model:

$$\Delta\text{GrainArea}_i = \alpha_1 + \alpha_2 \times \Delta\text{GrainSubsidy}_i + \alpha_3 \times \Delta P_i + \alpha_4 \times \Delta Z_i + \varepsilon_i \quad (1)$$

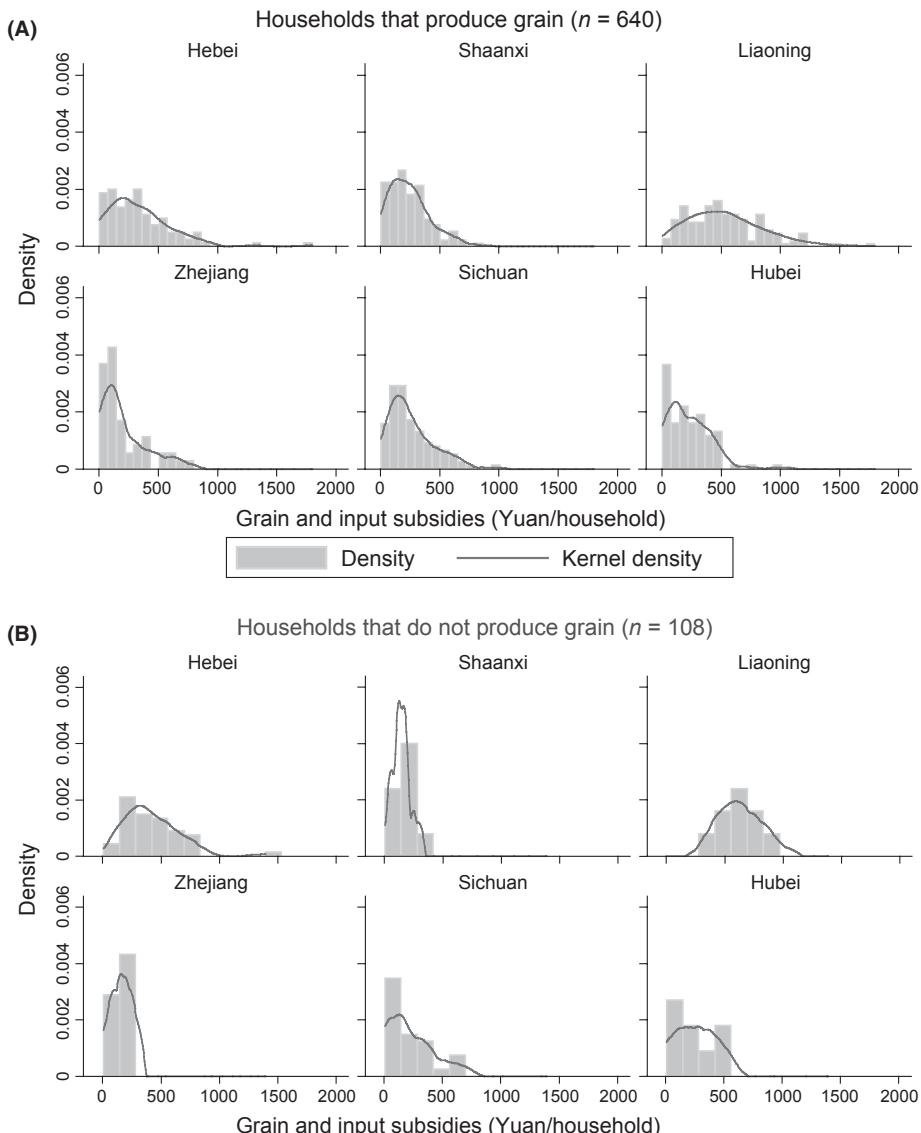
where  $\Delta\text{GrainArea}_{ij}$  is the change of the area sown to grain by household  $i$  between 2007 and 2008. In our model, we define grain area in two ways. In the first specification, we only include the four major types of grains that are typically thought to be of concern to China when they are discussing national food self-sufficiency. The four types of grains are rice, wheat, maize and soybeans. This is a household-level variable, varying for each household  $i$ . In the second specification, we include the sown area of

**Table 5** Number and share of households that produce grain and number and share of households that do not across provinces, 2008\*

	Samples	Grain production			
		Households that produce grain		Households that do not produce grain	
		No.	%	No.	%
Total	748	640	85.6	108	14.4
Hebei	158	110	69.6	48	30.4
Shaanxi	139	130	93.5	9	6.5
Liaoning	158	149	94.3	9	5.7
Zhejiang	55	50	90.9	5	9.1
Sichuan	134	105	78.4	29	21.6
Hubei	103	95	92.2	8	7.8

Source: Authors' survey.

\*The calculations are based on the households received grain or input subsidies in 2008.



Source: Authors' survey

Note: The calculation is based on the households that receive grain or input subsidies in 2008

**Figure 2** Kernel densities of grain and input subsidies per household across provinces for households that produce grain and those that do not, 2008.

all plots that planted any type of grain (including the four main types plus millet, sorghum, etc.).

On the right-hand side of Equation (1), we specify three sets of variables that should affect that change of grain area over time (between 2007 and 2008). Our key variable of interest is  $\Delta\text{GrainSubsidy}_i$  which is a measure of the change of household  $i$ 's grain subsidy between 2007 and 2008. In addition, we include the change in the grain price ( $\Delta P_i$ ) that the household

received between 2007 and 2008. The grain price in 2008 is deflated by the national consumer price index. Finally, we control for two more household-level variables in the control variable matrix  $Z_i$ . The first variable,  $Z_{1i}$ , is the change in the amount of cultivated land that the  $i_{th}$  household contracts from the village's leadership between 2007 and 2008. The second variable,  $Z_{2ij}$ , is the change in the amount of cultivated land that the  $i_{th}$  household rented in (rented out) from (to) other households between 2007 and 2008. The term  $\varepsilon_i$  is the error term and  $\alpha_1$ ,  $\alpha_2$ ,  $\alpha_3$  and  $\alpha_4$  are parameters to be estimated.

It is important to note that since all variables are differenced in equation (1), it is equivalent to the following model:

$$\text{GrainArea}_{it} = \alpha_0 + \alpha_1 \times t + \alpha_2 \times \text{GrainSubsidy}_{it} + \alpha_3 \times P_{it} + \alpha_4 \times Z_{it} + \mu_i + \varepsilon_{it} \quad (2)$$

where all of the variables in Equation (2) are the same as described above for Equation (1) except they are the levels of the variables for household  $i$  in year  $t$ , where  $t$  ranges from 2007 to 2008 (except for the price variable which only varies at the village level). In Equation (2), however, we add a set of household dummy variables that account for all nontime varying household-level fixed effects. In other words, when we estimate Equation (1), we are actually estimating a fixed effects regression that accounts for four time varying factors ( $\Delta\text{GrainSubsidy}_{ij}$ ,  $\Delta P_i$ ,  $\Delta Z_{1ij}$ ,  $\Delta Z_{2ij}$ ) and all nonvarying household factors. The coefficient of interest in both Equations (1) and (2) is  $\alpha_2$ .<sup>10</sup> The variables used in the empirical estimations are presented in Appendix Table A1.

### 4.3. Results

The results of the multivariate analysis (Tables 3 and 4) are consistent with the descriptive results reported and discussed earlier. In the first set of regressions, we use the full sample of households (including the households that produce and do not produce grain). When holding fixed other time varying factors ( $\Delta P_i$  and  $\Delta Z_i$ )<sup>11</sup> and all household fixed effects ( $\mu_i$ ), we find that there is no effect of changes in subsidies on changes in grain sown area. The  $\alpha_2$  coefficient in both the regressions that use the sample with the four major grains and the regression that uses the sample with all grains are both zero (columns 1 and 2). These results suggest that China's subsidy policy is not affecting grain sown area. From this, it is

<sup>10</sup> It is important to note that we are measuring the short-term effects of a change in subsidy. If – for whatever reason – the effect did not take place for a year or more after the subsidy, our approach would not pick up such a long-run approach.

<sup>11</sup> The coefficient,  $\alpha_3$ , on the change of price variable,  $\Delta P_i$ , is positive – as expected (and significant in three of four regressions). The magnitude of the coefficient implies the elasticity of grain sown area with respect to grain price is +0.34 (average from three regression), which is reasonable for farmers in a developing country like China.

possible to conclude that grain subsidy policies are not affecting grain sown area and likely are not having an effect on national food self-sufficiency.

When we restrict the sample to only grain producing households, we come to a similar conclusion (Table 6, columns 3 and 4). The coefficients on the subsidy variable in regressions reported in columns 3 and 4 are not positive (and, in fact, are negative – though the magnitudes are small). Hence, there is no evidence that subsidies are distorting the decisions of grain producers (columns 3 and 4) or any farmer (columns 1 and 2).

Since we do not have input subsidy estimates for 2007, we examine the effect of input subsidies on fertiliser use for a cross section of households in 2008. The model that we estimate is:

$$\text{FertiliserUse}_i = \beta_0 + \beta_1 \times \text{InputSubsidy}_i + \mu_j + \varepsilon_i \quad (3)$$

where  $\text{FertiliserUse}_i$  is fertiliser use per mu in 2008 by household  $i$  and  $\text{InputSubsidy}_i$  is the estimated amount of input subsidy in 2008. We also include  $\mu_j$ , which is a set of provincial ( $j = 1$ ); county ( $j = 2$ ) or village ( $j = 3$ ) dummy variables that seek to hold constant all province-wide (if  $j = 1$ ), county-wide (if  $j = 2$ ) or village-wide factors (if  $j = 3$ ) that affect fertiliser use.<sup>12</sup>

As in the case of grain subsidies, the multivariate analysis of the effect of input subsidies on input use illustrates that there is no effect (Table 7). The coefficient,  $\beta_1$ , is not statistically significant. Whether we use province, county or village dummy variables, we can infer from our results that there is no effect of input subsidies on input use.<sup>13</sup>

## 5. Summary and conclusions

In this paper, we have shown from household data that the MOF's reports on subsidies (reports on the size of subsidies; their growth; their direct transfers to farmers; and their targeting of poor farm households) appear to be valid. Although agricultural subsidies per farm are low, on per unit of cultivated area basis or total amount of budget, the subsidies are high. Almost all producers are receiving them. Both the poor and the rich are receiving them.

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<sup>12</sup> We do not include prices in cross section regressions, as they are already assumed to be picked up by the dummy variables. When we do include the variables (regressions not shown), the magnitudes of the coefficients are small and insignificant.

<sup>13</sup> As noted in De Gorter *et al.* (2008), there is an indirect way that China's subsidies might be affecting agricultural production. Because of the subsidies, there could be an income effect that is keeping the marginal farmer from moving into the migrant, off farm employment labour market. But please note: if the subsidy (which according to our analysis) is nondistorting, it may keep farmers in agriculture, but it will not induce them to over produce any individual crop. This means, of course, that the subsidies might affect overall agricultural self-sufficiency. It might also have the other unintended consequence of stabilising incomes. By giving farmers a lump sum transfer, regardless of production, the income of farmers should be more stable.

**Table 6** Impacts of grain subsidies on grain areas by household fixed effect model using 2007 and 2008 data<sup>†</sup>

	Households that produce grain ( <i>n</i> = 588)			
	All households (those that produce grain and those that do not produce grain) ( <i>n</i> = 718)		Total grain sown areas	
	Four major grain sown areas <sup>‡</sup>	Total grain sown areas	Four major grain sown areas <sup>‡</sup>	Total grain sown areas
	(1)	(2)	(3)	(4)
Contracted land area planting by oneself (Mu)	0.013 (0.007)*	0.014 (0.010)	0.003 (0.006)	0.004 (0.008)
Rent-in cultivated land (Mu)	0.055 (0.044) -0.0003 (0.0004)	0.078 (0.057) -0.0004 (0.001)	0.047 (0.034)	0.067 (0.051)
Grain subsidy (Yuan/Household)				
Grain subsidy per sown area for all grain crops (Yuan/Mu)	0.574 (0.396)	1.338 (0.519)***	0.912 (0.282)***	1.664 (0.422)***
Real grain price <sub>t-1</sub> (deflated by CPI)	4.254 (0.561)*** 0.0001	3.863 (0.735)*** 0.03	4.985 (0.430)*** 0.04	4.788 (0.642)*** 0.10
Constant	1436	1436	1176	1176
R-squared				
Observations				

Source: Authors' survey.

Note: Standard errors in parentheses. \*, \*\* and \*\*\* are statistically significant at 10%, 5%, and 1%, respectively.

<sup>†</sup>The estimation is based on the households reported receiving grain subsidy in 2007 and 2008.<sup>‡</sup>Four major grain are rice, wheat, corn and soybean.

**Table 7** Impacts of input subsidy on fertiliser use (fertiliser/total cropping sown area – measured as yuan/mu) by sample households in 2008

	Fertiliser use (yuan/mu)		
	Using provincial dummies	Using county dummies	Using village dummies
	(1)	(2)	(3)
Input subsidy per crop area (yuan/mu)	0.302 (0.196)	0.263 (0.207)	0.101 (0.214)
Constant	65.490 (13.871)***	56.384 (30.781)*	40.000 (59.227)
Observations	196	196	196
R <sup>2</sup>	0.05	0.23	0.35

Notes: Standard errors in parentheses. The symbols \*, \*\* and \*\*\* mean that coefficients are statistically significant at 10%, 5% and 1% levels, respectively.

There are some special characteristics of China's subsidy programmes. Although national subsidies are allocated from Beijing to the provinces and from the provinces to the counties on the basis of grain production, local officials have chosen to allocate subsidies to households in ways that do not appear to be distorting – mostly on the basis of contract land. Indeed, according to our data, subsidies are mostly being given to the land contractor. The tiller is not the target of the subsidies. And, most importantly, the subsidies appear to be nondistorting. No matter if we look at descriptive statistics in tables, scatter plots or regression analyses, there is no evidence that grain subsidies are distorting producer decisions. Grain area is not associated with grain subsidies. Fertiliser use is not associated with input subsidies. Indeed, from this analysis, it is fairly clear that while China's subsidy programme is raising the income of farm households, it is not achieving its national grain self-sufficiency goals (whether leaders are conscious of this or not). Importantly, these findings suggest that China is not going against its WTO promises in the area of subsidies since these are clearly nondistorting (green box type) policies. Interestingly, because China's Ministry of Agriculture's WTO office considers these policies domestic in nature and nondistorting, they do not even believe they need to report them as market distortion policies to the WTO.

In conclusion, it is clear that the subsidy programme in China is becoming a big deal. It is very popular in the countryside and, therefore, it is likely to be a fixture of China's agriculture for a while. However, this programme, so far, is mainly an income transfer programme. And, so far, it is being accomplished with few distortions to grain sown area or input use.

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## Appendix

**Table A1** Descriptive Statistics of the variables used in the regressions

	2007			2008			Average of 2007 and 2008		
	No. of observation	Mean	Standard deviation	No. of observation	Mean	Standard deviation	No. of observation	Mean	Standard deviation
<b>Dependent variables</b>									
Four grain sown area (Mu)	718	5.2	6.7	718	5.3	6.7	1436	5.2	6.7
Total sown area for all crops (Yuan)	718	5.9	7.0	718	6.1	7.1	1436	6.0	7.1
Fertiliser per sown area for all crops (Yuan/Mu)	n.a.	n.a.	n.a.	196	62.1	64.5	n.a.	n.a.	n.a.
<b>Independent variables</b>									
Contracted land area	718	7.7	44.5	718	7.9	45.2	1436	7.8	44.9
planting by oneself (Mu)	718	0.8	3.4	718	0.8	3.4	1436	0.8	3.4
Rent-in cultivated land (Mu)	718	178.2	333.5	718	272.5	395.4	1436	225.4	368.7
Grain subsidy (Yuan)	588	33.1	45.5	588	52.1	73.8	1176	42.6	62.0
Grain subsidy per sown area for all grain crops (Yuan/Mu)	718	1.47	0.09	718	1.56	0.07	1436	1.51	0.10
Grain price (Yuan/Kg)	n.a.	n.a.	n.a.	196	176	166.6	n.a.	n.a.	n.a.
Input subsidy (Yuan)	n.a.	n.a.	n.a.	n.a.	26.7	28.7	n.a.	n.a.	n.a.
Input subsidy per sown area for all agricultural products (Yuan/Mu)	n.a.	n.a.	n.a.	660	327.0	403.1	n.a.	n.a.	n.a.
Grain and input subsidy (Yuan)	n.a.	n.a.	n.a.	660	42.7	84.8	n.a.	n.a.	n.a.
Grain and input Subsidy per sown area for all agricultural products (Yuan/Mu)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

Source: Authors' survey.