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The Hebrew University of Jerusalem

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Agricultural Development in Uzbekistan: The Effect of Ongoing Reforms

by

Zvi Lerman

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P.O. Box 12, Rehovot 76100

ת.ד. 12, רחובות 76100

Agricultural Development in Uzbekistan: The Effect of Ongoing Reforms[1]

Zvi Lerman
Department of Agricultural Economics and Management, The Hebrew University of Jerusalem, Israel

Agricultural transition in Uzbekistan, as in all CIS countries, is driven by a process of land reform, which involves redistribution of land among producers and concomitant changes in farm structure. In this article we review the process of land reform since Uzbekistan's independence and examine its impacts on agricultural growth and rural family incomes. The analysis is based on official statistics and data from a farm-level survey carried out in 2007.

1. The importance of agriculture in Uzbekistan

Despite its mineral riches, Uzbekistan is a highly agrarian country, with its rural population at more than 60% and agriculture accounting for around 30% of both employment and GDP. As is typical of economies dependent on agriculture, Uzbekistan has low income per capita: $2,250 compared with nearly $12,000 for Russia (PPP equivalents, 2006 data from *World Development Indicators*). The low income and the high agrarian profile justify and drive the efforts for agricultural reform in the hope of improving the population's well being.

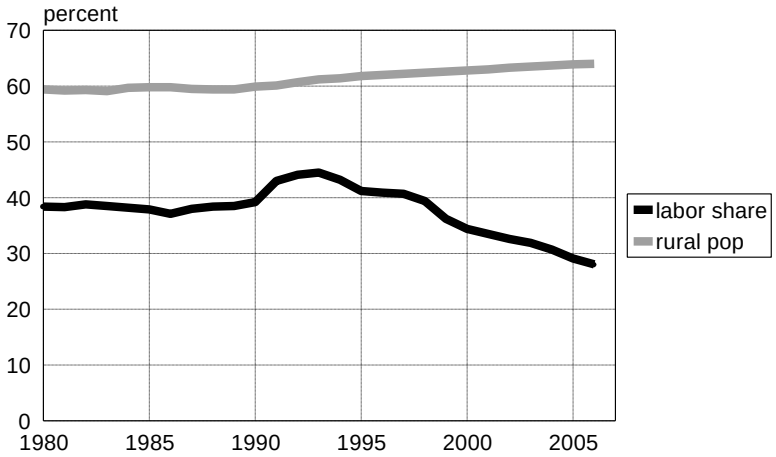

Figure 1.1. Share of rural population and share of agriculture in employment 1980-2006.

In terms of developments over time, the share of agriculture in GDP has fluctuated between 20% and 30% since 1995, showing a definite downward trend during the last few years. The share of rural population, on the other hand, is steadily increasing over time due to higher population growth rates in rural areas (from a constant 60% up to 1990 to 64% in 2004-2006; **Figure 1.1**, gray curve). The share of

[1] This article is an outgrowth of analytical work carried out during the period June 2007-May 2008 under the auspices of UNDP/Tashkent and Mashav – Division for International Cooperation in Israel's Ministry of Foreign Affairs. Sections 1-3 rely on data from official publications of the State Statistical Committee of Uzbekistan (see list of references at the end); the data in Section 4 are from the farm-level survey carried out for UNDP in August 2007 by Tahlil Sociological Research Organization in Tashkent. The opinions expressed in this article are solely the author's.

agricultural employment also remained steady at 40% up to 1990, but after a slight increase (to 45%) in the first years of transition (1991-1993) the trend changed to a downward slide. The share of agriculture in total employment had dropped to 28% by 2006 (**Figure 1.1**, black curve). Usually, rural population and agricultural employment rise hand in hand, and the opposing trends in Uzbekistan since 1993 are a puzzle.

Agriculture in Uzbekistan is critically dependent on water. Crop production and most of livestock production (with the exception of the karakul sheep grazing in the desert) is confined mainly to irrigated areas. All cotton is grown under irrigation, and grain production largely shifted to irrigated lands in the 1970s. The share of dry farming declined over the years, and it accounts for less than 20% of arable land today. The rapid population growth necessitated continuous expansion of irrigated areas over the years. The total area under irrigation increased from 2.2 million hectares in 1953 to 4 million hectares in 1985 (**Figure 1.2**). The expansion of irrigation accelerated after 1970, and peak growth was achieved in the decade 1976-1985, when the irrigated area was growing at an average rate of 90,000 hectares per year. The introduction of new irrigated lands slowed down considerably after 1985 (to about 30,000 hectares per year) and stopped almost completely after independence. This slowdown in the last twenty years was due not only to increasingly acute budget constraints, but also to the realization that the potential for irrigation expansion had been largely exhausted and new reclaimed areas were of marginal quality for agriculture. The irrigated area has remained static at 4.2 million hectares since 1990.

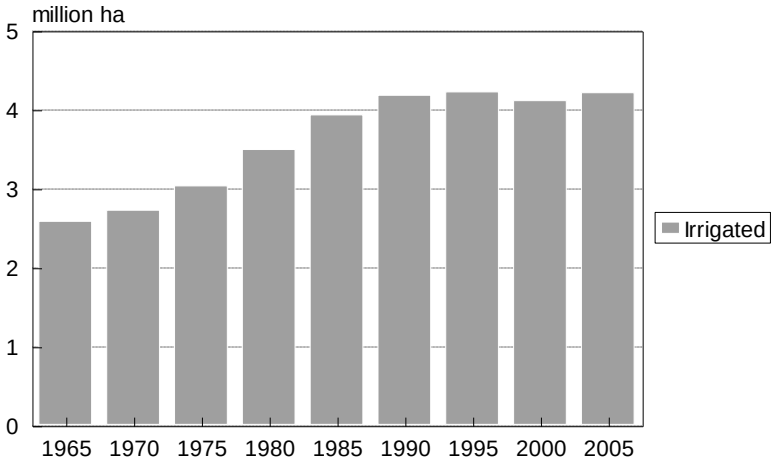

Figure 1.2. Growth of irrigated land in Uzbekistan 1965-2005.

Huge glaciers covering more than 8,000 sq. km in the high mountains in the East are the main store of water for Uzbekistan: glacier-fed rivers and mountain streams rising mainly in Tajikistan and Kyrgyzstan provide more than 95% of the water used for irrigation. The groundwater resources do not contribute significantly to the total supply of irrigation water, and groundwater is mostly used to water desert pastures from wells. Water is pumped from reservoirs, and also directly from the two major rivers of Amu Darya and Syr Darya, in quantities fixed by multilateral agreements with Uzbekistan's neighbors. Water has always been regarded as a nationally owned resource, and the irrigation system is built, run, and operated by the state. The volume of water needed to irrigate crops is set by scientists working in research institutes, and not by farmers who produce the crops. The government absorbs the cost of delivery through the regional canal network, and farms pay today 10,000-20,000 som ($7.5-$15) per hectare per year for irrigation water.

2. The legislative framework for agrarian reform

Inherited structure

Agriculture in Uzbekistan, as in all other Soviet republics, was traditionally organized in a dual system, in which large-scale collective and state farms coexisted in a symbiotic relationship with quasi-private individual farming on subsidiary household plots. The large-scale farms were the backbone of commercial agriculture, feeding agricultural products into the state-controlled distribution system. Yet the subsidiary household plots produced much in excess of their subsistence needs, and typically sold their surplus products to the local large-scale farm, to the state-controlled consumer coop network, and partly also in nearby towns, where the bazaar was a well-established traditional institution. While cultivating only 3% of arable land, the household plots consistently accounted for 20%-25% of gross agricultural product in Uzbekistan during the last decades of the Soviet era, a much higher proportion than their share of land. This was accomplished mainly by concentration in livestock production. Since 1970, the households in Uzbekistan had more cattle in absolute numbers than the collective and state farms combined.

In addition to livestock production, the small household plots specialized in labor intensive horticulture, producing 30% of the total output of potatoes, 45% of vegetables, and 60% of fruits and berries during the decade 1980-1989. Scale crops requiring purchased inputs and mechanization, such as cotton and grain, were grown mainly by collective and state farms. Thus, up to 1990, household plots produced about 5% of grain (mainly as feed for their animals) and no cotton. This specialization within the dual agriculture was to a large extent the result of a conscious government strategy, because in many countries cotton is grown by smallholders without sophisticated machinery. The emphasis on large-scale cotton fields and mechanical picking (57% of all cotton in 1990 was picked by machines) was an outcome of Soviet ideology for industrialization of agriculture.

The process of land reform

The current phase of agricultural reform in Uzbekistan began in 1989, more than two years before independence, as a natural extension and adaptation of Gorbachev's centrally initiated attempt to increase food production and improve farm efficiency. The 1989 legislation proceeded in the dual track of giving more land to households and encouraging restructuring of large-scale farms for better efficiency. Over less than two years, the total area in the household sector increased by 60% from 250 thou. ha to 400 thou. ha as the maximum plot size on irrigated land was raised to 0.25 ha from pre-1990 norms of 0.16 ha in collective farms and 0.08 ha in state farms. This initial phase of the reform process also spelled out the first principles of farm restructuring through creation of autonomously operating subdivisions and intra-farm family leaseholds in large-scale collective and state farms, which were now allowed to lease land to families of workers and groups of families (Land Law, 1990). First examples of a fundamentally new farm structure – the peasant farm – began to emerge in 1991, as members of large-scale collective and state farms were given the option of exiting with their share of land and assets to embark on independent private farming outside the existing collectivist framework. This new form of family farm received legal recognition in the Law of Peasant Farms adopted in July 1992, which led to a rapid increase in the number of registered peasant farms from less than 2,000 in 1990-1991 to 50,000 in 2000-2001 and then to nearly 200,000 in 2006. The average size of peasant farms doubled over the years, rising from less than 10 hectares in the early 1990 to about 20 hectares of arable land in the early 2000s (comparable to the average farm of 20 ha in Ukraine and 40 ha in Russia).

The early reforms culminated with the adoption of a new Land Code in April 1998, which reaffirmed the Soviet tradition of exclusive state ownership of all land while introducing significant measures of land tenure and farm structure reform.

Ownership and tenure of land

While already the pre-independence legislation encouraged changes in land tenure and farm organization, all land remained property of the state. The principle of state ownership of land, which prevailed in Russia and the original Soviet republics since October 1917, was adopted in Uzbekistan in December 1925. After independence exclusive state ownership of land was incorporated in the new Uzbek Constitution of December 1992 and subsequently reiterated in the 1998 Land Code. Agricultural land is allocated to the users by the state, but without any rights of transfer. Land held by families in lifetime inheritable possession cannot be sold, given away as a gift, or exchanged; land leased from the state by individual users cannot be subleased (a form of subleasing – "intrafarm leasing" – is allowed only to worker families within a *shirkat*). Users pay for the use of state-owned land in the form of land tax of lease payments, but no "downpayment" is required when land is allocated.

The official rationale against private ownership of land is two-fold: first, it includes the universal argument of the need to avoid speculation in land and accumulation of large tracts in the hands of absentee owners; second, it relies on the specific Uzbek reality, where land is useless without water, and water is a national resource delivered by a state-run irrigation system. In retaining exclusive state ownership of land, Uzbekistan followed what was the accepted practice among most of its Central Asian neighbors in the early 1990s and consciously departed from the policy of other large republics of the former Soviet Union – Russia and Ukraine, which legalized private (individual and collective) ownership of land alongside state ownership. In 2008, however, Uzbekistan remains one of only two countries in the entire former Soviet Union in which all agricultural land is state owned (Tajikistan is the second; Belarus retains state ownership of agricultural land intended for commercial farming, but recognizes private ownership of household plots). This situation is about to change very slightly in 2008, as in the future it will be possible to privatize land allocated to household plots for purposes of construction.

Land is the only productive asset in Uzbekistan that cannot be owned privately (by individuals or collectives). The new constitution declared that "the economy of Uzbekistan, evolving towards market relations, is based on various forms of ownership." It explicitly allowed "private property, along with other types of property." The Law of Property, as amended in May 1994, recognizes three main forms of ownership. These are private property, collective (*shirkat*) property, and state property (including municipal). Property of foreign investors and international organizations is introduced as a distinct, fourth category. Private property in Uzbek law is the property of individuals. The definition of collective property is broader than usual: it includes partnerships, cooperatives, joint-stock companies, and all shareholder structures in general.

The sweeping universal restrictions on transactions in land prevent the emergence of land markets and place Uzbekistan among a rapidly shrinking minority of former Soviet republics that adhere to non-market mechanisms of land management. Tajikistan, despite maintaining state ownership of agricultural land, has made land use rights transferable and Turkmenistan, recognizing notional private ownership of land, is the only other Central Asian country that still prohibits all land transactions. Uzbekistan's other neighbors, Kazakhstan and Kyrgyzstan, recognize private land ownership and allow relatively unrestricted transactions in land. In other former Soviet republics, such as Russia, Ukraine, Moldova, and the Transcaucasus states, the initially imposed restrictions on transactions have been largely eliminated.

In the absence of functioning land markets users cannot adjust the size of their holdings at will: they cannot easily acquire additional land so as to increase production; nor can inactive users dispose of their unnecessary land by transferring it to more active or efficient users. In the present situation, for instance, livestock farmers facing shortage of arable land for feed crops cannot turn to elderly or infirm neighbors and lease their land for crop production. Absence of land markets as a medium for transfer of land among users is a serious constraints to improving the efficiency of agriculture.

Changing farm structure

The 1998 Land Code recognized three types of farms or agricultural producers in Uzbekistan: the traditional household plots were renamed "dekhkan farms"; the large-scale collective and former state farms were classified as agricultural production cooperatives (*shirkats*), although other organizational forms – joint-stock societies, limited liability companies, partnerships, etc. – were also allowed in agriculture; a new category of peasant farms (*fermerskie khozyaistva*) was introduced between the small dekhkan farms and the large-scale shirkats. Each of these organizational forms received a special law of its own, and the three new laws – the Law of Dekhkan Farms, the Law of Peasant Farms, and the Law of Shirkats – were passed simultaneously with the Land Code in April 1998. The main characteristics of the three farm types are summarized in **Table 2.1**.

Table 2.1. Main characteristics of farms of different types in Uzbekistan

	Dekhkan farms	Peasant farms	Shirkats (agricultural enterprises)
Definition	A partially commercial farm based on a household plot	An independent commercial farm organized as a legal body	A large-scale corporate farms based on membership shares with private ownership of assets
Labor	Family members	Mainly family labor, with some hired help	Members, hired workers
Land allocation	Arable land in the village	Prime shirkat land acquired in return for membership shares; also reserve land, unutilized shirkat land, land of unprofitable shirkats, land in partially irrigated areas	Prime agricultural land around villages
Land tenure	Lifetime inheritable possession	Long-term lease (10-50 years)	Permanent possession for agricultural purposes
Owners	Workers of agricultural enterprises, rural employees, pensioners	Any adult person with sufficient agricultural qualifications or experience; typically former worker of agricultural enterprise	Members-shareholders
Production specialization	Vegetables, livestock	Any crop or livestock	Mainly scale crops (wheat, cotton)

Shirkats and other agricultural enterprises can be characterized as corporate farms, while dekhkan farms and peasant farms are two components of the individual or family farm sector. The main difference between these two components of the individual farming sector is mainly that of size: while dekhkan farms have 0.2 ha of land, an average peasant farm has around 15 ha. Another formal difference is that members of peasant farms are self-employed, while household plots are run by families whose members typically also have a job in some agricultural or non-agricultural organization. These two factors are probably sufficient to account for deep behavioral and psychological differences between the two types of farming.

A third important difference between dekhkan and peasant farms is linked to specific land tenure arrangements in Uzbekistan. Peasant farmers lease their land from the state, and the lease contracts specify the exact areas that have to be sown to cotton and wheat – the country's two strategic crops for which state orders are maintained. The 1998 Law of Peasant Farms further stipulates that leased land should be cultivated with due diligence so as to yield a certain minimum harvest of cotton and wheat per hectare. Presidential Decree 3342 accompanying the new strategy for the development of peasant farms (October 2003) states bluntly that any deviation from the sowing pattern prescribed in the land lease contract is a grave violation constituting grounds for termination of the farm's lease. Through these tenure-linked obligations the peasant farmers actually inherited the burden of fulfilling the state orders for cotton and wheat that had been traditionally borne by collective and state farms and more recently by shirkats. Peasant farmers have become the state's official suppliers of these strategic commodities. Dekhkan farmers, on the other hand, are free from state orders. They receive their land in lifetime inheritable possession without any strict obligations (other than the usual requirements of conserve land quality and other ecological considerations). They are thus free to grow and produce anything that they wish on their small plots.

A fourth highly significant difference concerns the ability to participate in land market transactions by leasing additional land from the state. Peasant farmers are allowed to bid in official tenders for tracts of irrigated land that become available for allocation. This is an acceptable market mechanism for farm enlargement. Dekhans, on the other hand, are limited by law to 0.35 hectares of irrigated land per family and cannot bid in such tenders. The only mechanism to enlarge a dekhkan farm is by applying to district authorities with a request for low-quality unirrigated land (up to 2 hectares), including an undertaking to ameliorate the additional land for cultivation at his expense.

Ongoing changes in farm organization

The intention of the Uzbek government to reduce state ownership of business enterprises was formulated in the Law of Destatization and Privatization adopted in November 1991, just two months after the declaration of independence. In application to agriculture, the general strategy for reducing the direct involvement of the state in business enterprises primarily involved transformation of state farms into collective farms and other shareholder forms, as well as reorganization of large-scale state-owned livestock and poultry complexes into joint-stock companies. The destatization of state farms in Uzbekistan had been completed by 1992, as most were transformed into collective farms, agricultural production cooperatives, and joint-stock companies. The small number of state farms remaining are appropriately engaged in the production of public goods, such as agricultural education, research and development, livestock and crop selection.

It was originally thought that the transformation of collective and state farms into production cooperatives and private agricultural companies would dramatically improve their efficiency and help them go from chronic losses to new profits. In the 1990s all farm-reorganization programs in Uzbekistan stressed the goal of restructuring loss-making enterprises and various pilot projects were implemented with the objective of transforming loss-makers into profitable farms. This strategy espoused the traditional socialist ideology of economies of size ("large is better") and accordingly strove to achieve "horizontal transformation" of inefficient large-scale enterprises into hopefully efficient large-scale corporate farms. This strategy was doomed to fail, as experience in all CIS countries shows, and the shirkat phase of Uzbek agriculture was short-lived. The 1998 Land Code introduced the shirkat as the new organizational form that would make agriculture efficient and profitable. It was decreed at that time that all collective farms and other agricultural enterprises should reorganize as shirkats by 2001. Yet the

hopes placed in this old-new organizational form did not materialize and just five years later, in 2003, a new strategy abandoned the shirkat as unprofitable and shifted the emphasis to peasant farms as the optimal organizational form for long-term development of agriculture (the main points of the 2003 strategy are summarized in **Table 2.2**). The new strategy opened the road for "vertical transformation", i.e., transition from large-scale corporate farms to much smaller family farms with clear commercial orientation. In response to the new strategy, the number of shirkats declined rapidly from over 2,000 in 2003 to just 314 in 2006 as their land was broken up into relatively small allotments, and the remaining shirkats are slated to be dismantled into peasant farms in 2007-2008.

Table 2.2. Main points of the 2003 strategy for the development of peasant farms in Uzbekistan

- Recognize peasant farms as the preferred farm type for the future development of agriculture, based on long-term leasing of state land
- Create a legal framework for complete economic and financial independence of peasant farms
- Ensure market-based financing arrangements for peasant farms:
    - complete accountability for farm production expenses
    - access to commercial bank credit with an option to mortgage the land use rights
- Create education and training programs in business and farm management for peasant farmers
- Ensure accelerated development of a market-oriented rural infrastructure capable of providing the full range of services to peasant farms
- Facilitate the development of "alternative" providers of machinery and mechanical field services for peasant farms
- Confirm the farmers' obligation to produce for the state in accordance with the sowing pattern prescribed in the lease contract

Source: *Kontseptsiya razvitiya fermerskikh khozyaistv na 2004-2006 gody*, Presidential Decree 3342, October 2003.

The land reform legislation that emerged in Uzbekistan after 1989, and especially in 1998, proved resilient enough to take the country through three major waves of farm restructuring. The first wave involved strengthening of household plots and first attempts at internal reorganization of agricultural enterprises through introduction of independent subdivisions and intra-farm family-based leases (1989-1997); the second wave mainly focused on formal reorganization of traditional collective farms into shirkats (agricultural cooperatives) simultaneously with further strengthening of household plots (now called dekhkan farms) and establishment of peasant farms as an entirely new organizational category (1998-2002); finally, the third wave starting in 2003 boldly shifted the agricultural sector to predominantly individual farming – dekhkan farms in livestock production, peasant farms in crops – while restricting the role of corporate farms (agricultural enterprises) to highly specialized operations.

Livestock sector reform: Presidential Decree 308 of March 2006

The livestock sector in Uzbekistan is traditionally dominated by rural families, not large commercial farms. Back in the Soviet period, more than 50% of livestock were in the care of rural households. The share of households increased over time as large state-owned livestock complexes were privatized and dismantled during the first phase of reform in the 1990s. In parallel efforts began to encourage livestock specialization among the emergent peasant farms, but these essentially preferred to concentrate in crop production. Today peasant farms manage about 5% of cattle in Uzbekistan, while 95% is in households (dekhkan farms). Agricultural enterprises have no role in the livestock sector beyond livestock selection farms, experimental stations, and some specialized karakul sheep operations in the desert.

Livestock production in Uzbekistan suffers from low efficiency, which is manifested in very low milk yields. Presidential Decree 308 of March 2006 is intended to provide strategic and tactical instruments

for the improvement of milk yields and overall efficiency of livestock production. The main points of the decree are summarized in **Table 2.3**. Recognizing the dominant role of household farms in the livestock sector, the decree appropriately focused on support measures designed to increase the number of cattle or cows in each family and on development of services designed to improve livestock productivity. These measures are basically consistent with the findings of our report. As we demonstrate in **Section 4**, the size of the household herd is one of the main factors for increasing family incomes and wellbeing, while quality feed and veterinary services, including artificial insemination, are crucial for increasing milk yields. Moreover, larger household herds and greater production volumes are likely to stimulate commercialization among households, which on the one hand will further raise family incomes, but on the other hand requires government support for the development of sales channels.

Table 2.3. Livestock Development Program in Uzbekistan

Program objectives:

- Increasing the number of both dekhan farms and peasant farms engaged in livestock production
- Improve livestock productivity
- By these means resolve existing difficulties with rural employment and raise rural family incomes

In line with these objectives, the decree introduces the following measures:

- Rural people engaged in livestock production in household plots and dekhkan farms (i.e., rural households that do not qualify as peasant farms) will be regarded by the state as gainfully employed and will be accordingly entitled to state pension. This decision applies irrespective of whether the rural households sell any of their livestock products or consume everything within the family. This is a totally new approach to the standing of rural households in the labor economy.
- Encourage household plots and dekhkan farms to increase their herd. Implement a charity program financed by businesses, wealthy peasant farmers, and public organizations, whereby poor families with many children will be entitled to receive one cow. These efforts should increase the cattle herd in dekhkan farms from 6 million head in 2005 to 8.5 million head by the end of 2010.
- Encourage peasant farmers to double their herd from 330,000 head of cattle in 2005 to 660,000 head of cattle in 2010, while increasing the number of specialized livestock farmers from 8,000 in 2005 to 11,000 in 2010. The share of peasant farms in the cattle herd will accordingly increase from 5% in 2005 to about 7.5% in 2010.
- Improve the access to veterinary and artificial insemination services by expanding the network of service points.
- Organize auctions for sale of pedigree cattle to household plots, dekhan farms, and peasant farms. The program envisages sale of 100,000 head of pedigree cattle through auctions to farmers between 2006-2010.
- Expand microcredit facilities for household plots and dekhkan farms (excluding peasant farms) to facilitate purchase of cattle. A total of 158 billion som will be allocated to microcredit between 2006 and 2010, of which 80% will come through commercial banks (at subsidized interest rates and using streamlined lending procedures) and 20% through the rural support fund. Given that cattle sells for about 2 million som in auctions, the microcredit facility will be sufficient to buy less than 80,000 head of cattle between 2005 and 2010 – a drop in the sea compared with the projected increase of 2.5 million head in household plots and dekhkan farms (see 1 above).
- Improve the access of rural households (household plots and dekhkan farms) to concentrated feed by instructing the state-controlled suppliers to establish feed storage facilities and sale outlets in rural areas. The program envisages a seven-fold increase in the number of sale outlets for concentrated feed across the country, from 113 in 2005 to 773 in 2010. State-controlled feed mills will be allowed to purchase grain directly from peasant farmers (and not through state procurement channels) as a raw material for concentrated feed production.
- Pedigree livestock breeders will be exempt until 2010 from custom duties on all imports of genetic materials and related equipment.

3. Outcomes of land and livestock reforms

Changes in land use

The beginning of land reform in 1989 had an immediate impact on the rural population. Total agricultural land allocated to household plots (called dekhkan farms today) doubled from about 200,000 hectares to 400,000 hectares in less than two years, and then continued to grow to 600,000 by 1995-1997. Despite this trebling of family holdings in the early 1990s, the household plots accounted for less than 3% of all agricultural land up to 1997 and agricultural enterprises – former collective and state farms – continued to dominate Uzbek agriculture. It is only the second phase of land reform, following the adoption of the new Land Law and related farm legislation in 1998, that triggered highly significant shifts in the established pattern of land use in Uzbekistan. The land controlled by agricultural enterprises began to shrink rapidly, as most of it shifted to peasant farms – a new form of individual or family-based farming recognized by the 1998 Land Code and the associated Law of Peasant Farms. This shift from corporate farms (agricultural enterprises) to individual farming is particularly striking when we consider the changes in the use of arable land: in **Figure 3.1** we see the rapid shrinkage in arable land used by corporate farms after 1998 (the dark bottom layer) and the corresponding increase in arable land used by peasant farms (the gray wedge in the middle), while the arable land in household plots remains virtually constant (black layer on top).

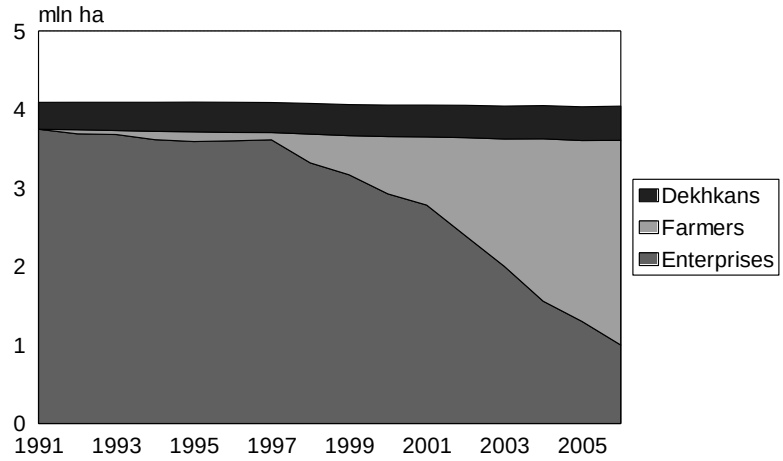

Figure 3.1. Use of arable land by farms of different organizational forms 1991-2006.

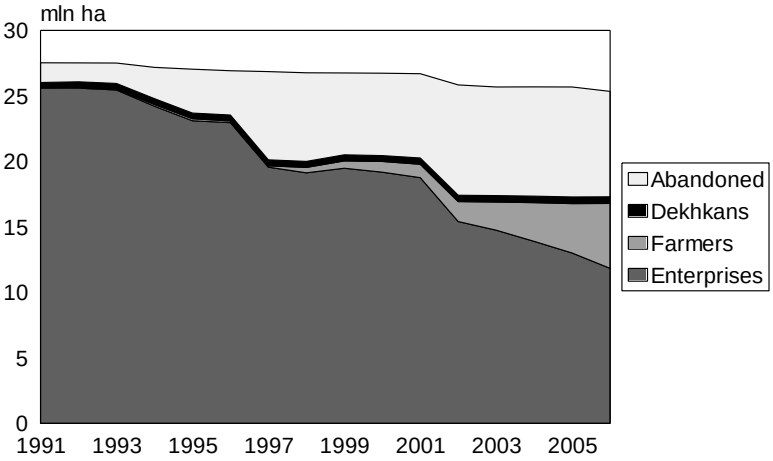

Figure 3.2. Use of agricultural land by farms of different organizational forms 1991-2006.

A generally similar pattern of change is observed for all agricultural land (**Figure 3.2**), which in addition to arable land also includes pastures, meadows, and land under perennial orchards and vineyards. Here the decline of agricultural enterprises is less pronounced than in arable land (compare **Figure 3.1**) due to their relatively high proportion of pastures: it is mainly arable land, not pastures, that is reallocated in the process of reform from agricultural enterprises to peasant farms. Another notable feature of changes in agricultural land is the overall decrease in land use by all categories of agricultural users: the top light-gray layer in **Figure 3.2** represents the difference between the land used in farms (as reported by the Ministry of Agriculture) and the available agricultural land as reported by Goskomzem (the land monitoring authority). The gap represents abandoned land, i.e., land not claimed by agricultural users. The abandoned land has reached 6 million hectares in recent years. This is primarily pastures, as virtually all arable land appears to be allocated to users.

As a result of these changes in land use, the share of the individual farming sector – both household plots and peasant farms – increased from about 3% to 30% in agricultural land since 1991. The share of individual farms in arable land rose even more dramatically and it now approaches 80% (**Figure 3.3**). Given the information in **Figures 3.1** and **3.2** we conclude that most of the land in the individual sector is represented by peasant farms, not household plots. The share of peasant farms in arable land approaches the target set for 2007 in the 2003 strategy for the development of peasant farms (72.1% of irrigated land), but their share in agricultural land is still far from the target of 63.3%, as most pastures continue to be locked in a small number of remaining enterprises.

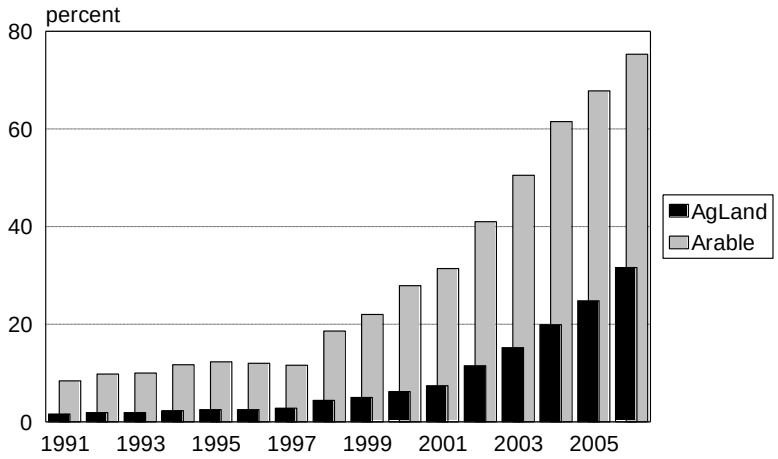

Figure 3.3. Share of agricultural and arable land in individual use (dekhkan and peasant farms).

Changes in the livestock sector

Alongside the increase in land use, the reform has led to a substantial increase in cattle in individual farms (**Figure 3.4**). The specific pattern of change in livestock differs from the change in land tenure. Already during the Soviet era more than half the cattle was in household farms (compare this number to 3% of agricultural land and 10% of arable land in household plots during this period). After 1990, and especially after 1995, the number of cattle in enterprises decreased, while the number of cattle in rural households increased sharply. The overall outcome of these oppositely directed changes was a marked increase in the total number of cattle in Uzbekistan (from 5 million to 7 million head). The increase in the number of cattle is entirely attributable to the increase in the household sector, which more than offset the decline in the enterprise sector. The peasant farms play a distinctly marginal role in livestock: the cattle in peasant farms increased over time, but it does not exceed 5% of the total herd in the country. This is in stark contrast to the share of peasant farms in land use, which reaches 65% of arable land and

nearly 30% of agricultural land in 2006 (see **Figures 3.1** and **3.2**). The overall share of the individual sector (dekhkan farms and peasant farms combined) has reached 98% of cows, 96% of cattle, and 80% of sheep and goats, where most of these numbers are in household plots, not in peasant farms (**Figure 3.5**). This is much higher than the share of the individual sector in land use, and we can say that the livestock sector in Uzbekistan is clearly dominated by the individual sector, and specifically by dekhkan farms (i.e., household plots). Peasant farms, on the other hand, play a much more central role in crop production due to their large endowment of arable land. While dekhkan farms are the dominant force in Uzbekistan's livestock sector, the average dekhan farm has just 1.4 head of cattle and 0.8 cows, compared with 42 head of cattle and 13 cows in livestock-oriented peasant farms. The bulk of cattle in Uzbekistan is thus held in a huge number of very small household farms: 4.5 households keep more than 6 million head of cattle and 2.7 million cows – more than 90% of Uzbekistan's herd.

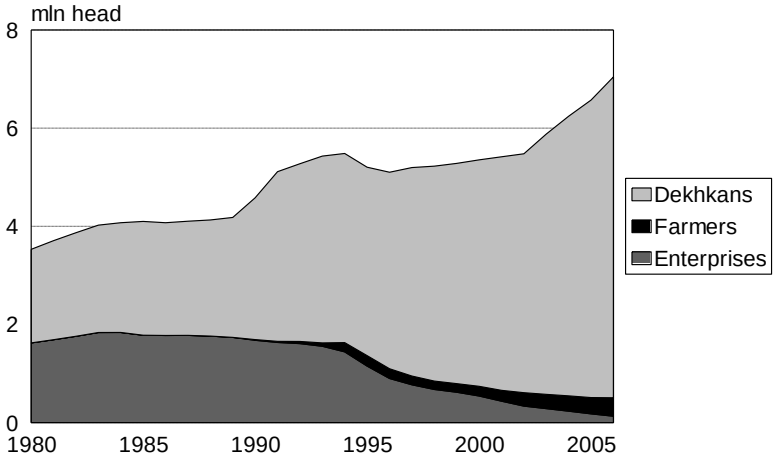

Figure 3.4. Cattle herd in farms of different organizational forms.

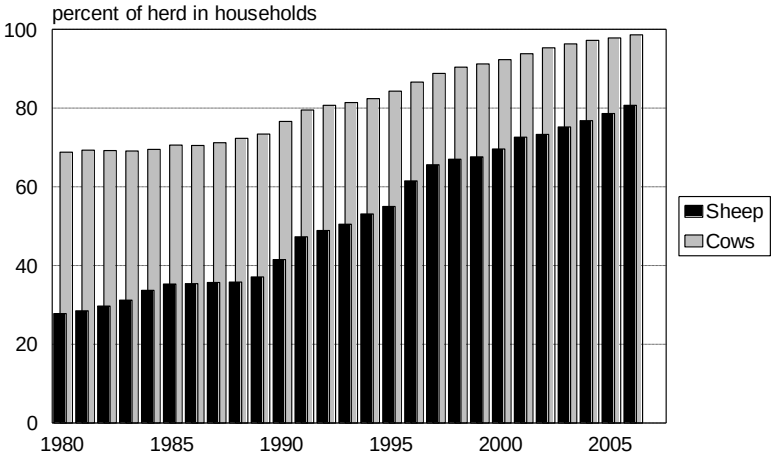

Figure 3.5. Share of cows and sheep in the individual sector (dekhkan and peasant farms).

The increase of the cattle herd, and especially the number of cows, in the process of reform is reflected in an increase of the share of livestock production in Uzbekistan's gross agricultural output (GAO). Livestock production increased from 30%-35% of GAO in the pre-1990 period to 45%-50% since 1997 (**Figure 3.6**). The increase in the importance of livestock production in Uzbekistan in recent years can be best judged by comparison with the traditional livestock-producing countries, such as Russia, Ukraine, Belarus, Kazakhstan, and Kyrgyzstan. The share of livestock production in these countries dropped from 55%-60% before 1995 to about 45% in recent years, while in Uzbekistan the share of livestock production increased to about the same level.

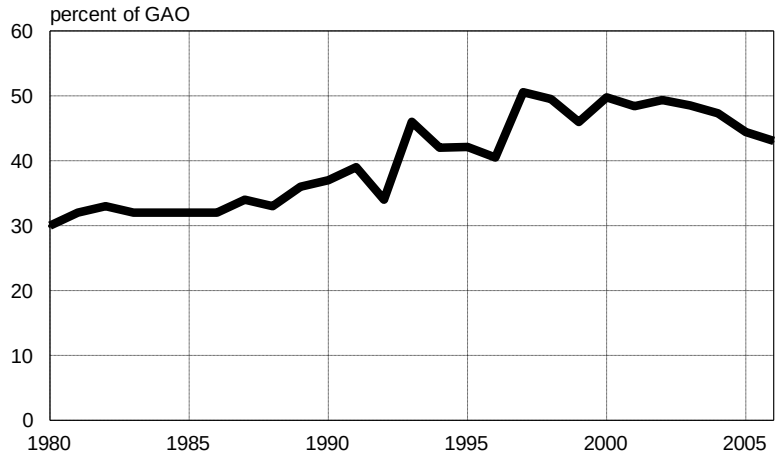

Figure 3.6. Share of livestock production in GAO.

Feed base and milk yields

The increases in the livestock herd have not been matched by corresponding increases in production of feed crops for animals. On the contrary, the livestock feed base has shrunk dramatically since 1991, aggravating the loss of pastures noted previously in **Figure 3.2**. After increasing from 700,000 ha to 1,100,000 ha during the last decade of the Soviet period, between 1980 and 1991, it dropped to about 500,000 ha in the late 1990s and continued to decline to less than 300,000 ha in 2004-05 (**Figure 3.7**). The land released from feed crops was mainly directed to wheat production as part of the state's strategy to achieve food self-sufficiency in the early years of independence. Since agricultural land is state-owned in Uzbekistan, cropping patterns are predetermined centrally on the basis of state plans for the production of the two main cash crops – cotton and wheat. Any changes in cropping patterns – both in the past and today – require top-level government decisions. Farmers are not free to increase the areas under feed crops to their previous levels, as this will inevitably affect the areas cropped to cotton and wheat – the two strategic crops subject to state production orders.

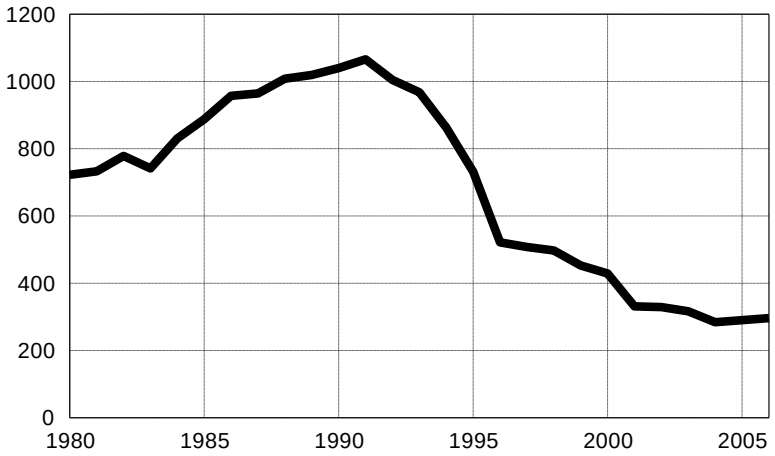

Figure 3.7. Area under feed crops 1980-2006.

The shrinkage of the feed base continued despite the rapid growth in total herd. As a result, the area under feed crops per head of cattle was cut in half from 0.20 ha/head in the 1980s to 0.10 ha/head in the 1990s and it now stands at less than 0.05 ha/head, i.e., 25% of the steady-state level in the 1980s. Paradoxically, the decline in areas cropped to feed did not affect adversely the milk yields, which have remained fairly constant (and very low) at about 1,600 kg per cow per year since 1990. This may be attributable to the fact that the average milk yields in Uzbekistan are predominantly determined by milk production in the dekhkan farms, which anyhow do not have much land to allocate to feed crops: they

typically send their cows to graze in the open, on harvested fields, along the roads, and near waterways, remaining perversely independent of both feed crop harvests and formal pastures.

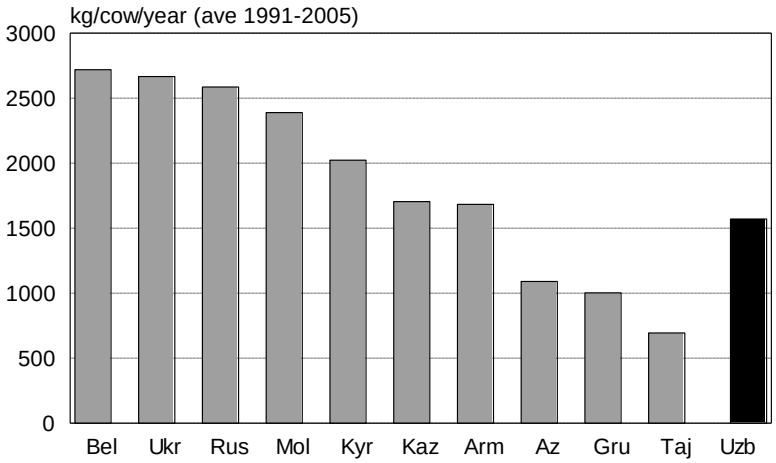

Figure 3.8. Milk yields for Uzbekistan and other CIS countries (Statistical Committee of the CIS, Moscow (2006), CD-ROM 2006-11).

The milk yields show a very slight increase over time – from a touch below 1,500 kg per cow per year in the 1980s to slightly more than 1,600 kg per cow year since 2000. These are very low yields by comparison with Europe and the U.S. (8,000 kg per cow per year) or Israel (11,000 kg per cow per year). More troubling than the comparison to Western economies is the fact that the Uzbek milk yields are substantially lower than in other CIS countries (2,000-2,700 kg per cow per year in Belarus, Ukraine, Russia, Moldova, and Kyrgyzstan) and exceed only those in Azerbaijan, Georgia, and Tajikistan (**Figure 3.8**).

Agricultural production and productivity

The differential changes in the distribution of land and livestock by farms of different types have led to striking changes in the structure of agricultural production in Uzbekistan, especially after 1997-1998. The production in enterprises dropped from about 35% of the total in 1997 to just 6% in 2006. The production in dekhkan farms remained fairly stable at slightly over 60% since 1997, while the production in peasant farms grew from 3% in 1997-1998 to nearly 32% in 2006. Peasant farms have thus exceeded the production target set for 2007 in the October 2003 strategy for the development of peasant farms. We see from **Figure 3.9** that agricultural production has in fact shifted from enterprises to peasant farms since 1997: the decrease in production in agricultural enterprises (bottom dark gray layer) has been compensated by a corresponding increase in production in peasant farms (black layer above it). The dekhkan farms (top light gray layer) have retained their dominant – and relatively constant – share throughout the entire period (prior to 1997, with peasant farms at their initial formative stage, it is the dekhkan farms that were increasing their share of agricultural output at the expense of the shrinking enterprises).

The phenomenon of peasant farms taking over from agricultural enterprises is demonstrated with particular clarity in **Figure 3.10**, which shows the changing shares of crop production since 1995. Focusing on the latest years since 2002-2003, we note that the share of crop production in dekhkan farms remains constant at around 40%, while the share of peasant farms rapidly increases at the expense of agricultural enterprises. This shift in crop production from agricultural enterprises to peasant farms is consistent with the shift of arable land noted in **Figure 3.1**.

With regard to livestock production, the dekhkan farms continue as the dominant force, having gradually increased their share to more than 90% of total livestock output in 2006. Both enterprises and peasant farms play a strictly marginal role, with peasant farms contributing less than 3% of livestock production. This is also consistent with the distribution of the herd over farms of different types (**Figure 3.4**), where dekhkan farms are seen to account for 93% of all cattle in 2006, while peasant farms control a mere 5%.

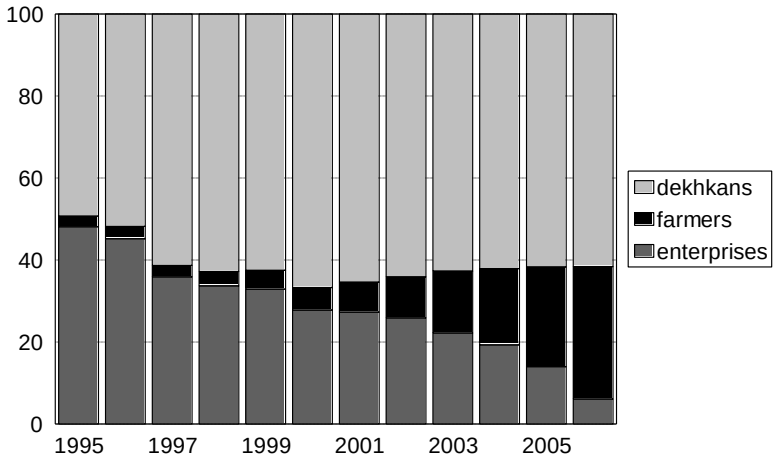

Figure 3.9. Structure of agricultural production (GAO) by farm type.

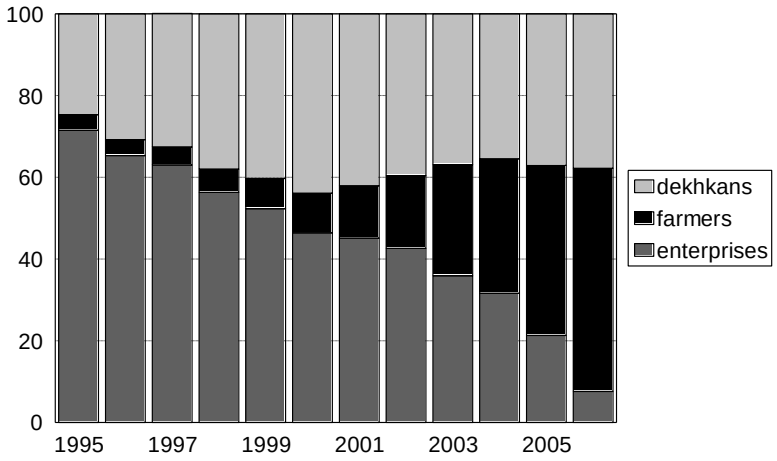

Figure 3.10. Structure of crop production by farm type.

We conclude that the second phase of reform, starting with the adoption of the 1998 Land Code and related legislation, was characterized by a dramatic shift of production (mainly crops) from agricultural enterprises to peasant farms. But it is clearly the dekhkan farms that come out as the star player of the process of reform. The dekhkan farms maintained their leading role in agricultural production throughout the period, contributing over 60% of gross agricultural output. The role of dekhkan farms is particularly prominent in livestock production, where they account for more than 90% of output, but they are also a very significant player in crop production, contributing nearly 40% of crop output in recent years.

Ultimately, the success of agricultural reforms is measured first by growth in production and second by changes in agricultural productivity. Fortunately for Uzbekistan, the early phases of transition (up to 1997) did not involve dramatic declines in agricultural production, as in other CIS countries. The agricultural output essentially stagnated between 1980 and 1997, but then it took off, rising by more than 60% between 1998 and 2007 (**Figure 3.11**, black curve). Moreover, the increase in agricultural

production was entirely attributable to the individual sector – dekhkan and peasant farms combined – as the production of agricultural enterprises eroded by more than 70% during this period (dropping to 30% of the level in 1997; **Figure 3.11**, gray curve). The process of agricultural reform encouraging and emphasizing transition from the traditional large-scale enterprises to individual farms – both peasant and dekhkan – has produced remarkable results in terms of production growth in agriculture. This effect of agricultural growth spurred by individualization of agriculture is not unique to Uzbekistan: it is observed in other CIS countries that have encouraged transition to individual farming.

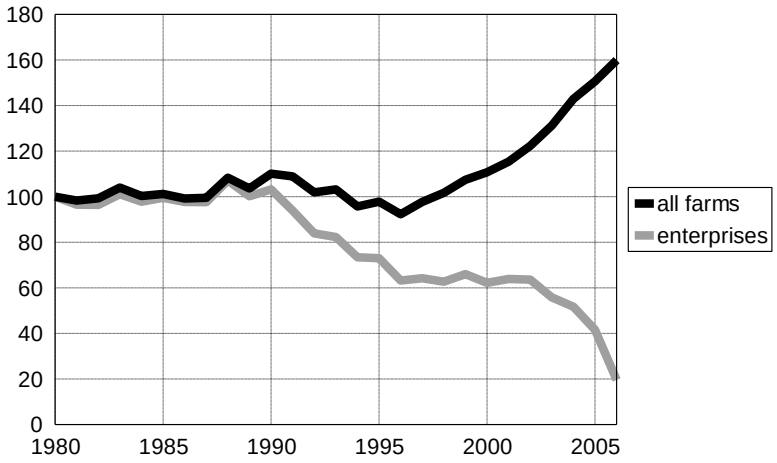

Figure 3.11. GAO for all farms and agricultural enterprises 1980-2006.

Agricultural productivity is usually calculated as partial productivity of land (value of agricultural output per hectare of agricultural land) and partial productivity of labor (value of agricultural output per agricultural worker, including self-employed dekhkans). More sophisticated measures rely on total factor productivity (TFP), which aggregates the partial measures into one index that allows for the entire basket of resources and inputs used in agriculture. TFP is technically difficult to calculate, but even the calculation of partial productivity measures involves certain problems as it requires good knowledge of resources – the area of agricultural land used for production and the number of employed in agriculture (both workers for hire and self-employed). **Figure 3.12** shows the three curves that constitute the basis for productivity calculations: agricultural production (gray curve), agricultural land in use (thin black curve), and agricultural employment (thick black curve). The curves span the period 1980-2006 and they are all normalized to index numbers with 1980=100, thus eliminating problems with differences in units of measurement.

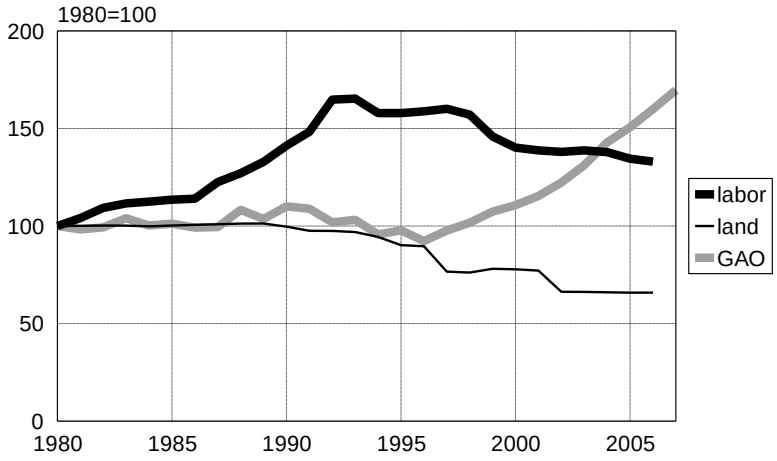

Figure 3.12. GAO, agricultural labor, and agricultural land 1980-2006 in percent of 1980 (1980=100).

Agricultural output has increased dramatically since 1997. Agricultural land, on the other hand, has declined: this is evident from **Figure 3.2** above, where we see that both land in use and available land decline over time (land in use declining much more rapidly). This essentially means that the partial productivity of land has increased, and at that by much more than the 60% increase in agricultural production. In fact, the productivity of agricultural land increased by almost 150% between 1997 and 2006 due to the combined effect of increasing production and decreasing land base (**Figure 3.13**, gray curve). Agricultural employment also seems to have declined fairly steeply since 1997, although the reasons for this are not entirely clear. Based on the given curve of declining agricultural employment in **Figure 3.12**, we conclude that the partial productivity of labor has also increased strongly since 1997 (after declining between 1980-1997 due to the increase in agricultural labor in the face of stagnating production; see black curve in **Figure 3.13**).

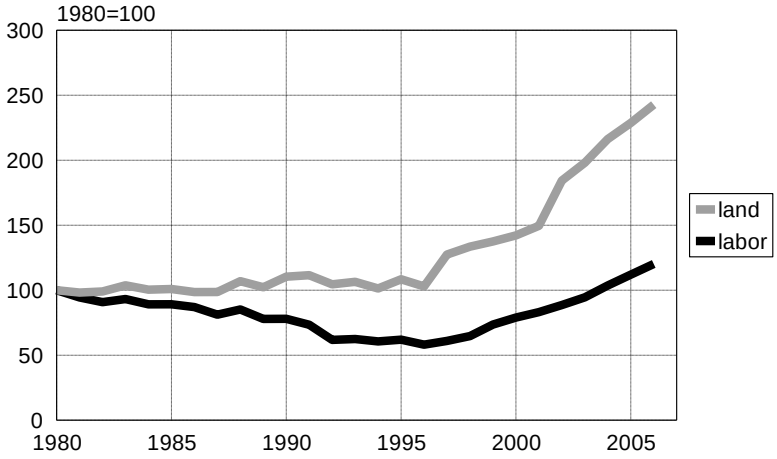

Figure 3.13. Productivity of agricultural land and labor 1980-2006.

Agricultural reforms in Uzbekistan are thus seen to have had a highly beneficial outcome, in terms of robust growth in both production and productivity. Another dimension that needs to be checked in future work is the impact of these processes on rural incomes and the wellbeing of the rural population. Unfortunately, no data are available for this analysis at the present stage.

4. Policy lessons from a survey of dekhkan and peasant farms

The underlying objectives of land reform in all transition countries are to increase the incomes and the well-being of their large rural populations which rely on agriculture for a substantial part of the family budget. In every CIS transition country this has been done through improving farm productivity and encouraging growth in the agricultural sector. The impact of land reform on agricultural growth has been examined in preivous sections. In this section we look at the effect of land reform on rural incomes and also on some micro-level determinants of productivity improvements.

Farm-level information supplementing the national statistics was obtained in a farm survey conducted in August 2007 in 8 of the country's 13 main administrative regions (from East to West: Ferghana, Namangan, Tashkent, Syrdarya, Djizak, Kashkadarya, Khorezm, and Karakalpakstan). The regions were selected on the basis of their agricultural profile with the purpose of ensuring a sufficiently representative coverage of the entire country. A total of 20 districts were then selected in these 8 regions, again with due regard to representativeness of the local conditions. The survey sample included a total of 1,600 respondents divided into two groups: 797 dekhkan farmers and 803 peasant farmers. The respondents were chosen at random in each district based on local lists. This section presents the

main conclusions and policy lessons derived from the farm survey regarding the impact of land distribution on rural incomes and possible productivity improvements in the livestock sector.

Dekhkan and peasant farms compared

The rural population covered by the survey is dichotomized into two groups: dekhkans and farmers. Dekhkans have only their small household plot, which consists of tomorka – the plot around the house and often also an additional plot somewhere on the periphery of the village. Farmers have a relatively large plot that they received for commercial farming, which is in addition to a household plot similar to that of all other rural residents. Farmers are in turn divided into crop farmers (which have land but no livestock) and livestock farmers (which in addition to land also keep animals). **Table 4.1** shows some comparative characteristics of these three groups of rural people.

Table 4.1. Selected characteristics of dekhkan households and farmers

	Dekhkan households	Crop farmers	Livestock farmers	All farmers
Number of respondents	797	402	399	803
Household plot	0.17	0.19	0.22	0.21
Farm plot	--	31.74	56.21	43.90
Total holdings	0.17	31.9	56.4	44.1
Household livestock	2.7	4.4	2.9	3.6
Farm livestock	--	--	56.8	28.2
Total livestock	2.7	4.4	59.7	31.9
Total income	267	451	560	505
Per capita income	47	74	90	82
Family size	6.0	6.6	7.2	6.9

Note: Livestock in this table aggregates all species (cattle, sheep, goats, poultry, etc.), expressed in standard head.

The differences between dekhkan households and farmers are significant by all variables: dekhkans have smaller families, less land, less livestock, and less income (both total and per capita). The difference in income is reflected not just in the means: dekhkans are observed to achieve lower incomes also when we control for land holdings and the size of the animal herd (this is evident from the negative farm type coefficient for dekhkans in **Table 4.4**).

The differences between crop farmers and livestock farmers are also generally significant: in addition to having more livestock (obvious by definition), livestock farmers have more land – which is presumably allocated with the purpose of enabling them to grow feed crops for their animals. Livestock farmers also earn a higher total income than crop farmers. The difference in per capita income, however, is not significant between these two groups of farmers, mainly because livestock farmers have larger families than crop farmers.

Substantial differences are observed in cropping patterns between livestock farmers and crop farmers; there are also notable differences between land use in peasant farms and in household plots. We start with a comparison between livestock and crop farmers. The main difference between the two groups of peasant farms (in addition to the difference in farm size; see **Table 4.1**) is in the land area under feed crops. Livestock farmers have nearly 30% of their land under grasses and feed roots, plus another 14% under corn, which is also mainly used for animal feed (**Table 4.2**). Crop farmers, on the other hand, devote only 3% of their sown area to feed crops and corn: they have no livestock and do not need feed – although in principle they could grow feed for sale to livestock farmers and dekhkans who do need it.

Wheat and cotton are the two other major crops in peasant farms, but livestock farmers allocate to these crops about half the area share allocated in crop farms: livestock farmers have 48% of their land under cotton and wheat (roughly in equal proportions), while in crop farms these crops take up almost 90% of the sown area (slightly more cotton than wheat).

Cotton characterizes the main difference between the use of land in peasant farms and dekhkan plots: cotton is only grown on peasant farms, where overall it accounts for more than one-third of the cropped area, whereas dekhkan plots have no cotton at all (**Table 4.2**). Instead of cotton, dekhkans concentrate on horticultural crops: potatoes, vegetables, melons, fruits, and grapes are the dominant component in household plots, taking up half the cropped area (compared to a mere 4% in peasant farms, **Figure 4.1**). Feed crops, corn, and other grains account for the rest of the cropped area in roughly equal proportions (15%-20% in each crop category). The share of land under feed crops and corn is close to that in livestock farms (about 35% in dekhkan farms compared to 45% in livestock farms, **Figure 4.1**). The emphasis on corn at the expense of wheat in dekhkan plots probably indicates that this cereal is grown as feed for household animals, while peasant farms – especially crop farms -- concentrate on wheat as a cash crop. There are no major differences in land use in household plots cultivated by dekhkan families and farmer families.

Table 4.2. Structure of cropped area in peasant farms and household plots

	Peasant farms			Household plots	
	Livestock farmers	Crop farmers	All peasant farms	Dekhkans	Farmers
Cotton	24.1	48.2	34.5	0	0
Corn	13.7	1.7	8.6	19.5	15.9
Wheat and other grains	24.2	40.5	31.2	18.5	22.9
All grains	44.2	44.6	44.4	38.0	33.5
Horticulture	2.5	5.9	4.0	47.9	52.6
Feed crops	29.2	1.3	17.1	14.1	13.9
All cropped	100	100	100	100	100
Average cropped area, ha	**36.4**	**26.7**	**31.5**	**0.14**	**0.15**

It may be argued that peasant farmers are obliged to grow cotton (and wheat) by virtue of the conditions imposed on them by the state through land lease contracts. Dekhkan farmers, on the other hand, are free from such obligations to state orders and they presumably forgo cotton as an unprofitable crop. To the extent that they grow wheat it mainly serves to feed household animals and to produce flour for the family – not to meet state orders as in peasant farms.

There are notable differences in the structure of income sources between dekhkans and peasant farmers (**Table 4.3**). Dekhkans rely heavily on wages from outside employers, while peasant farmers earn income primarily from farming. This difference is understandable given the considerable disparity in the size of farms between the two groups. The small size of dekhkan plots is not sufficient to ensure full-time employment for dekhkan family members, who are accordingly forced to look for outside work. Peasant farms, on the other hand, are much larger and do not leave time for outside occupations for farmers. Dekhkan families also receive a much greater share of remittances from family members working abroad: this is again linked to the smallness of the family plot, which forces some family members to emigrate in search for work.

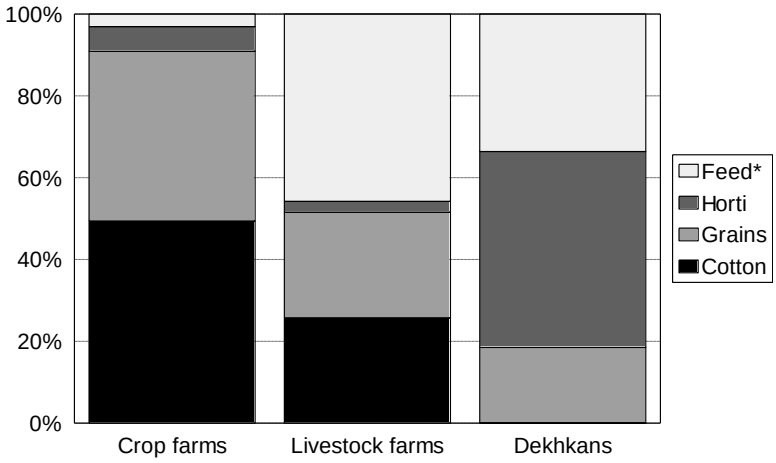

Figure 4.1. Cropping structure for dekhkan and peasant farms. *Feed crops include corn.

Table 4.3. Structure of family income for dekhkans and peasant farmers

Sources of family income	Dekhkans	Peasant farmers
Household plot (sales and consumption)	25.5	21.0
Crop production	15.1	n.a.
Livestock production	10.4	n.a.
Peasant farm (sales and consumption)	--	51.1
Wages	37.8	8.6
Non-ag business	9.5	3.7
Remittances	7.1	0.8
Other transfers	20.1	14.8
Total monthly income, %	100	100
'000 som	267	505

Family income and wellbeing

The essence of land reform in all CIS countries is to increase the land holdings of the rural population. The survey shows that both total family income and per capita income steadily grow with land holdings. These results are presented in **Figures 4.2** and **4.3**. While the result for *total* income is intuitively trivial (more land, more production, more income), the result for *per capita* income is not. Family income in our analysis includes cash income from all sources plus value of own products consumed in the household.

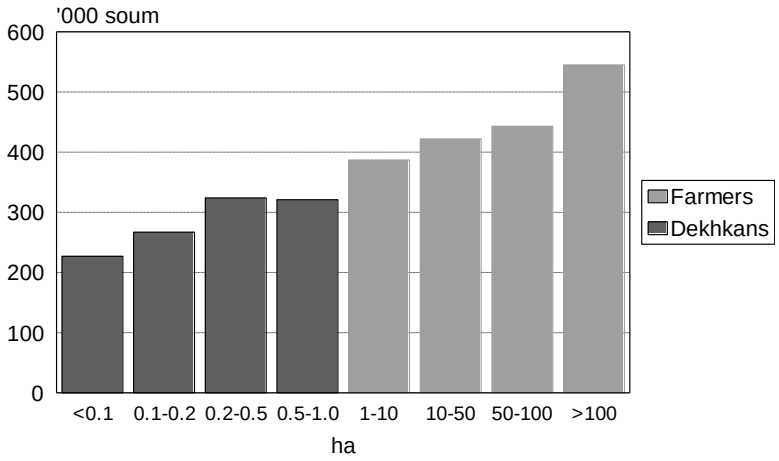

Figure 4.2. Family income vs. land holdings for dekhkans and peasant farmers.

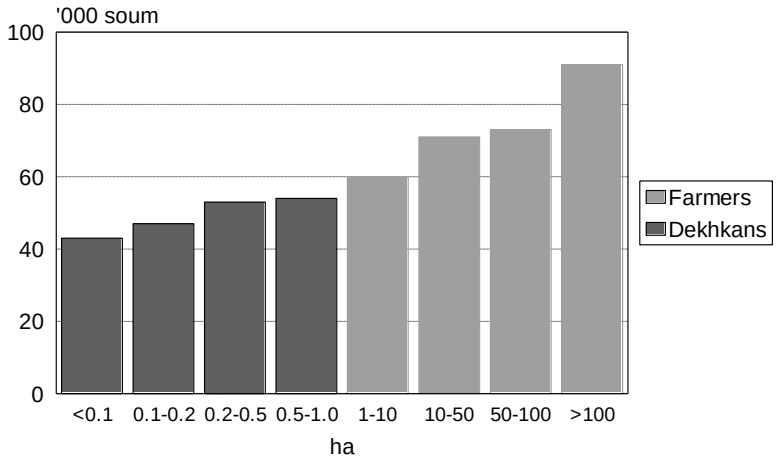

Figure 4.3. Per capita income vs. land holdings for dekhkans and peasant farmers.

Figures 4.2 and **4.3** incidentally highlight an interesting feature of land distribution in Uzbekistan: the dekhkan plots do not exceed 1 hectare; farmers' land holdings never fall below 1 hectare (this includes both the household plot and the farm plot). There is a sharp differentiation by land between the two groups of dekhkan farms and peasant farms, which is reflected in the total separation between dark and light gray bars in the two diagrams.

Given the positive effect of land holdings on income, it is desirable to check also the effect of the herd size on income per capita. This was done in a regression framework, modeling income per capita as a function of both land holdings and the number of cattle. The regression results presented in **Table 4.4** demonstrate that per capita income indeed increases with the increase of the herd size, controlling for land holdings. This conclusion holds when dekhkan households are analyzed on their own and also when dekhan households and peasant farms are analyzed simultaneously, controlling for farm type. For farmers analyzed on their own, the effect of land holdings is positive but not statistically significant, while the effect of cattle is positive and statistically significant. There are no significant differences between "livestock" farmers and "crop" farmers in the sample. Land holdings and cattle herd for farmers include both the dekhkan component and the farm component.

Table 4.4. Regression coefficients for per capita income as a function of land holdings and size of cattle herd

	Dekhkans only	Farmers only	Dekhkans and farmers simultaneously
Land holdings (in ha)	27.4	+0.14 (not signif.)	+0.14
Cattle herd (head of cattle)	2.6	+0.20	+0.21
Farm type effect: dekhkans vs farmers	--	--	-23.66
Intercept	36.53	70.32	70.26
Mean values by farm type:			
Per capita income (monthly, thou som)	47	82	--
Land holdings, ha	0.17	44	--
Number of cattle	2.3	28	--

Note: All regression coefficients are statistically significant at 10% level, except for the coefficient of land holdings for farmers when analyzed separately. In all three regression R-square is low (less than 10%), which means that further refinement of the model should be attempted.

The negative coefficient of farm type in **Table 4.4** implies that, on average, dekhkans earn less per capita than farmers, controlling for land and cattle. This result is consistent with the means reported for

monthly per capita income: 47,000 for dekhkans and 82,000 for farmers (the difference is statistically significant).

In addition to providing quantitative information on per capita income of rural families, the survey also collected qualitative information on subjectively perceived standard of living or wellbeing. Wellbeing was measured on a three-level scale – "low", "medium", and "comfortable" – based on the subjective perception of the family's standard of living ("what the family budget buys") as articulated by the respondents in the survey. Based on the entire sample, farmers enjoy a generally higher standard of living than dekhkans: 17% of farmers perceive their standard of living as "comfortable" compared to only 4% among the dekhkans; conversely 38% of dekhkans perceive their standard of living as "low" compared to only 11% among the farmers (**Table 4.5**).

Table 4.5. Subjective perception of wellbeing among dekhkans and farmers

	Low	Medium	Comfortable
Dekhkans (n=796)	38	58	4
Farmers (n=795)	11	72	17

Statistically, the percentages in **Table 4.5** can be interpreted as probabilities of achieving a given level of wellbeing. Thus, dekhkans have a probability of 38% of achieving a low standard of living and a probability of 4% of achieving a comfortable standard of living. Farmers have a probability of 11% of achieving a low standard of living and a probably of 17% of achieving a comfortable standard of living.

Multinomial logistic regression can be used to estimate the probability of achieving a given standard of living – low, medium, or comfortable – as a function of land holding and other endowments, such as number of cattle. **Figure 4.4** shows how the estimated probability of achieving each level of wellbeing varies with the amount of land held by the dekhkan family. The probability of having a low standard of living (red curve) decreases with the increase of land holdings, while the probabilities of having a comfortable and a medium standard of living (black and green curves) both increase with the increase of land holdings. The probability values on the three curves corresponding to each value of land holdings always sum to 1, which explains why a decrease in one probability (low level of wellbeing) is accompanied by an increase in the other probabilities (comfortable and medium standard of living).

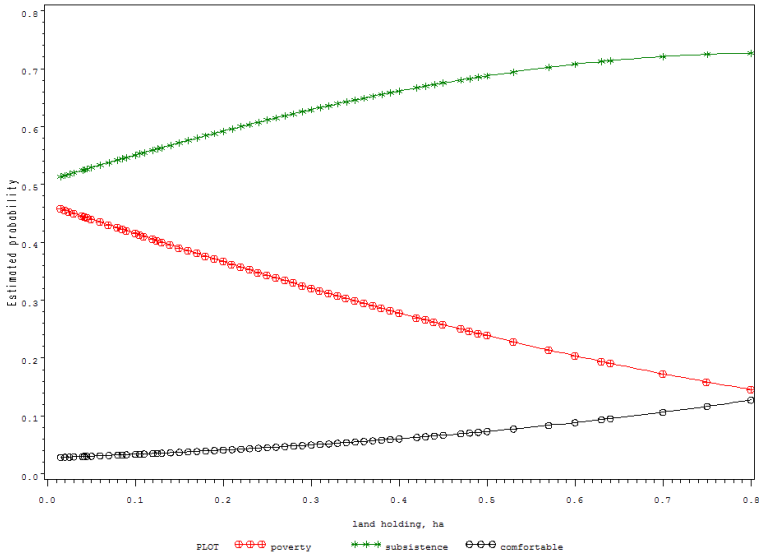

Figure 4.4. Probability of achieving a given level of wellbeing as a function of land holdings for dekhkan farms. Bottom curve (empty circles) – highest level of wellbeing ("comfortable"), top curve (crosses) – medium level, descending curve in the middle (crossed circles) – lowest level of wellbeing.

The picture remains basically the same when we estimate the probabilities of different levels of wellbeing as a function of the number of head of cattle: the probability of achieving the lowest standard of living decreases with the increase of the cattle herd, while the probability of achieving the highest and the medium standard of living increases. The probabilities for farmers show the same general behavior with land holdings and livestock herd as for dekhkans.

The probability of achieving a "comfortable" standard of living increases with the increase of land holdings and the number of cattle, while the probability of being in the lowest standard of living decreases with the increase of land holdings and the number of cattle. Thus, land and cattle – the two factors most immediately affected by land reform – have direct impact on poverty alleviation.

The generally higher standard of living among farmers compared with dekhkans is reflected in higher total income, higher per capita income, larger land holdings, and larger cattle herds (**Table 4.6**, last line). Moreover, examining the incomes and the endowments for different levels of wellbeing we observe in **Table 4.6** that the means increase as we move from the lowest to highest level of wellbeing. This is consistent with the probability estimates produced by logistic regression.

Table 4.6. Incomes and endowments for dekhkans and farmers by levels of wellbeing

Perceived wellbeing	Total income		Per capita income		Land holding, ha		Cattle, head	
	Dekhkans	Farmers	Dekhkans	Farmers	Dekhkans	Farmers	Dekhkans	Farmers
Low	197	451	36	72	0.16	30	2.0	16
Medium	303	458	53	72	0.18	44	2.4	23
Comfortable	429	738	71	129	0.19	53	2.1	51
All sample	267	505	47	82	0.17	44	2.3	28

Note: Means calculated using all observations, including those with zero values.

We conclude from the analysis of per capita incomes and wellbeing levels that rural wellbeing can be improved by focusing on ways to increase the land holdings and the cattle herd of the population, especially the dekhkans. Policies to facilitate the increase of land holdings should rely on further development of land markets through simplification and streamlining of leasing transactions. Easier access to land leasing should enable the enterprising dekhkans and farmers to increase their holdings and thus achieve higher levels of wellbeing. *Land and cattle have an important role in poverty alleviation for the rural population.* This conclusion is not unique to Uzbekistan: the same result is consistently observed in other transition countries, where rural incomes and wellbeing are seen to increase with the size of individual farms.

Commercialization of dekhkan farms

Dekhkan farms are often treated dismissively by government decision makers, because they are viewed as subsistence-oriented operations that do not really justify being called a farm. There are two ways of looking at commercialization: one is by estimating the percentage of households that sell at least some of their production; the other is by estimating the share of total production sold. By the first measure – the percentage of producers engaged in sales – dekhkan plots appear to be a subsistence activity: nearly two-thirds of dekhkan households with cows do not sell any milk, consuming everything they produce within the family. Yet the remaining one-third of dekhkans do sell, and quite a lot at that: these "commercial" dairy dekhkans sell on average 60% of their milk production (**Table 4.7**). Because of their high rate of sales, the average level of sales is around 20% of milk production for all dekhkan plots with cows – including the two-thirds that do not sell anything. Therefore, by the second measure – the share of output sold – dekhkan plots are anything but subsistence operations: they sell a very respectable

share of their milk production, even allowing for the large contingent of subsistence oriented households.

Table 4.7. Milk producing households classified into "sellers" and "non-sellers"

	Dekhkan households producing milk (n=534)
No milk sales, "non-sellers" in percent of all milk producers	64
Some milk sales, "sellers" in percent of all milk producers	36
Share of output sold by "sellers"	60
Share of output sold by all milk producers ("sellers" and "non-sellers" combined)	21

The dairy orientation is dominant among dekhkan farms with cattle: 31% sell milk, while only 6% sell meat (4% sell both). There is a much greater tendency to consume milk inside the household and to channel meat mainly for sales: dekhkan households sell only 40% of their milk production but fully 90% of their meat. Sales quantities reach 1600 kg of milk and nearly 400 kg of meat on average for a household that sells these commodities. Milk is selling for 270 som per kg, compared with 3,700 som per kg for meat.

Neighbors and acquaintances are the main sales channel for milk and meat from dekhkan farms (**Table 4.8**). Other prominent channels are sales in the market (presumably in the nearest town) and sales through intermediaries. Sales to neighbors and acquaintances, which are usually made in the same village and do not involve travel, are reported also by those who sell in the market or through intermediaries. On the other hand, sales through intermediaries and sales in the market are mutually exclusive for all practical purposes: dekhkans either deliver their products to an intermediary or make the effort of traveling to the market, not both.

Table 4.8. Sales channels for dekhkan farms (milk and meat)

	% of those who sell (n=211)
Neighbors, acquaintances	53
Market	36
Intermediaries	33

Note: percentages add to more than 100% because dekhkans use more than one sales channel: 26% of those selling to neighbors also sell in the market and 36% also sell through intermediaries. The overlap between sales in the market and sales through intermediaries is negligible (less than 10%).

The strong reliance on sales to neighbors and acquaintances provides indirect evidence of difficulties with transport and wholesale arrangements in the markets. In order to tap the large sales potential of dekhkans and ensure that their products are available to the urban consumer, the government should implement policies intended to facilitate the access of dekhkan producers to markets. This may include establishment of rural integrators, transport operators, and wholesalers that should simplify the dekhkans' access to markets. Intermediaries fulfill an essential function in setting up marketing channels, and their functioning should be encouraged.

Commercialization levels of dekhkans increase with the increase of milk yields (a measure of production efficiency), the increase of the dairy herd, and hence the increase of total production volumes through a combination of the two factors. In other words, households that produce more milk (because they have more cows and achieve higher yields per cow) sell a higher share of their output. This result is summarized in **Figure 4.5**, which shows the quantity of milk production for dekhkan farms with various commercialization levels (from no sales to sales of over 75% of milk output).

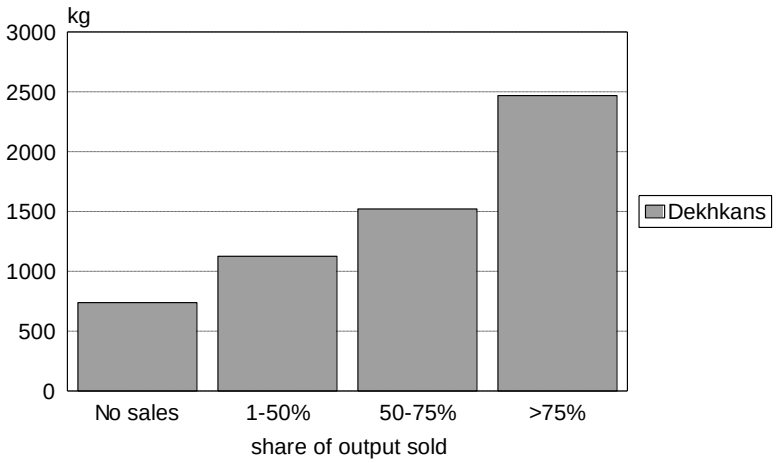

Figure 4.5. Milk production by level of sales for dekhkan farms.

A more detailed summary is given in **Table 4.9**, which presents various characteristics of dekhkan households classified by commercialization levels (again from no sales at all to sales reaching 75% of total milk production). The combination of higher yields and more cows results in greater output: more production generates surplus milk, which leads to higher commercialization. Family size naturally increases the needs of the family and reduces the surplus available for sale. We accordingly see a decrease of family size for higher levels of commercialization. Land has no effect on commercialization levels in dairy production, probably because all dekhkans have roughly the same small plot and the variability of land holdings across farms is not very pronounced (for 90% of dekhkans the plot size falls between 0.1 and 0.4 hectares).

Table 4.9. Farm characteristics by commercialization level for dekhkan farms that produce milk

	No sales	Up to 50% of milk production	50-75% of milk production	Over 75% of milk production
Dekhkan farms (n=534)	64%	16%	12%	8%
Cows, head	1.1	1.2	1.5	1.9
Milk yield, kg/cow	735	950	1074	1225
Milk production, kg	739	1126	1521	2468
Family size, persons	6.4	6.1	6.0	5.3
Plot size, ha	0.19	0.18	0.22	0.19

The decision to sell has a major impact on total family income and per capita income. Dichotomizing the dekhkan farms into "sellers" (i.e., those reporting some revenue from farm sales) and "non-sellers" (farms without any sales revenue), we observe that sellers achieve higher total income and higher per capita income than non-sellers (**Table 4.10**).

Table 4.10. Total family income and income per capita for "sellers" and "non-sellers" among dekhkan farms

	"Non-sellers"	"Sellers"
Family income, '000 som/month	231*	250*
Per capita income, '000 som /month	40*	63*

*Differences between "sellers" and "non-sellers" statistically significant for p=0.01.

The government should encourage commercialization of dekhkan farms not only from considerations of delivery of farm products to consumer markets, but also as a mechanism for poverty alleviation in rural areas. This can be accomplished by helping dekhkan farmers increase their herd and improve milk yields through proper farm practices.

Improving milk yields through genetics, feed, and animal care

We have seen in **Figure 3.8** that milk yields in Uzbekistan are among the lowest in all CIS countries. Given the relatively low technological level of the agricultural infrastructure in Uzbekistan, attempts to increase milk yields should focus on the basics, namely genetics, feed, and animal care. In practice, this means attention to breed selection (mainly through artificial insemination, not so much through imports), feed delivery channels, and veterinary services.

The survey results show that use of **artificial insemination** increases the milk yields by more than 30% in both household cows and livestock farms. Milk yields in household cows increase from 925 kg/cow/year without artificial insemination to 1210 kg/cows/year with artificial insemination; in livestock farms artificial insemination raises milk yields from 1120 kg/cow/year to 1520 kg/cow/year (**Table 4.11**).

Table 4.11. The effect of artificial insemination on milk yields of household cows

	Household cows			Livestock farms (n=352)
	Dekhkans (n=560)	Farmers (n=476)	All sample	
Without artificial insemination	848	1011*	925*	1120*
Using artificial insemination	993	1382*	1210*	1518*

*Differences statistically significant at p=0.01.

Unfortunately, only a small proportion of dekhkans (less than 5%) are daring or innovative enough to use artificial insemination. Most dekhkans continue with the traditional method of "taking the cows to the bull", although there are no complaints about the cost or the quality of the service. The practice of artificial insemination is more widespread in application to "commercial" cattle in livestock farms (as opposed to household cattle). Fully 12% of livestock farmers use artificial insemination for their "commercial" herd (while only 4% of farmers bother with artificial insemination for their household cattle; see **Figure 4.6**).

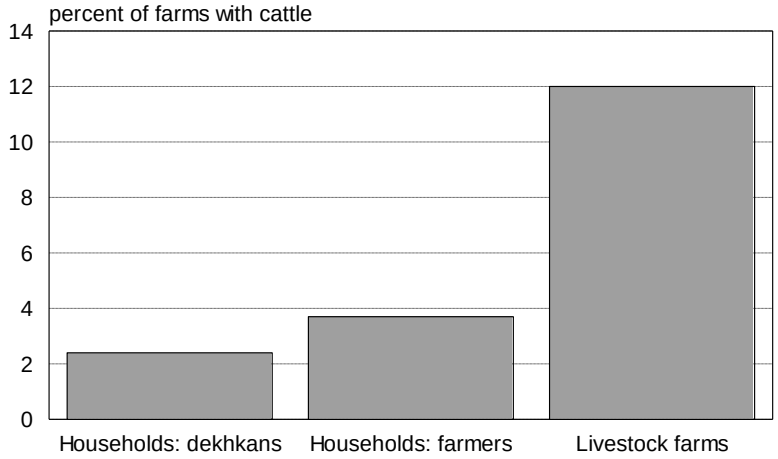

Figure 4.6. Frequency of artificial insemination in households and livestock farms.

Peasant farmers are completely satisfied with the quality of artificial insemination services (almost 90%) and generally have no complaints about the cost or the accessibility. Those who do not use artificial insemination either have a bull of their own on the farm (53%) or, like dekhkans, find it easier to "take the cows to the bull" (40%). Judging by the difference in milk yields, the semen from the bulls used for "domestic" insemination is far inferior to the genetic material used for artificial insemination. However,

there is room for significant improvement even of the genetic material available for artificial insemination in Uzbekistan.

Given the spectacular impact of artificial insemination on milk yields, policies should encourage public awareness campaigns in favor of artificial insemination and should focus on making artificial insemination broadly available to both dekhkans and farmers. Directed efforts should be made to improve as much as possible the quality of semen used for artificial insemination by organizing purchases from reputable sources.

Milk yields achieved by dekhkan households increase with the level of **feed sufficiency**. This fact was elicited in responses to a strictly qualitative question, which asked for the dekhkans subjective evaluation of feed sufficiency for their animals. The dekhkans characterized feed sufficiency on a three-level scale: insufficient feed, feed just sufficient for the existing livestock, and feed available in optimal quantities. A statistically significant increase of milk yields is observed as the quantity of feed available to the household increases from insufficient to just sufficient and finally to optimal. Milk yields increase from 730 kg/cow/year in households that suffer from insufficient availability of feed to 840 kg/cow/year in household where feed quantities are "just sufficient" and nearly 930 kg/cow/year in households that indicate availability of "optimal" quantities of feed for their cattle (**Figure 4.7**).

The dependence of milk yields on feed sufficiency and a range of other factors was explored more rigorously by regression analysis for dekhkans and livestock farmers separately. The results are presented in a qualitative form in **Table 4.12**, where "+" indicates that the corresponding factor has a statistically significant positive effect on milk yields: milk yields increase with the increase of that factor.

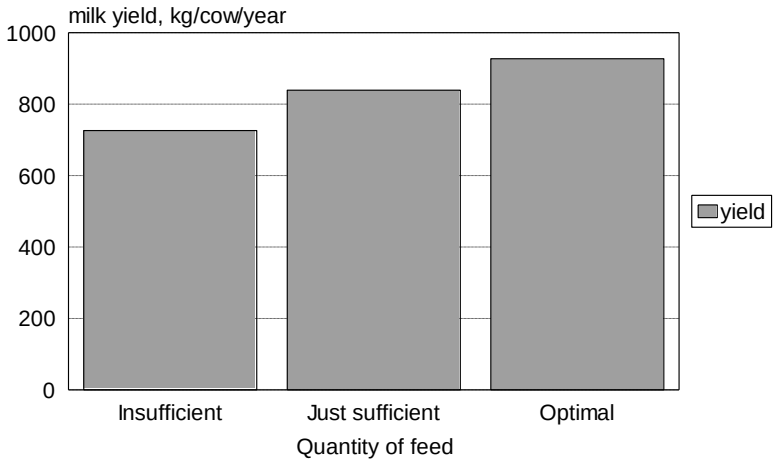

Figure 4.7. The effect of feed sufficiency on milk yields: dekhkan farmers.

The main finding for our purposes is the positive effect of feed sufficiency on milk yields. Feed sufficiency was estimated by calculating, in tons per cow, the quantity of purchased feed and feed grown on the farm as reported in the survey. This represents use of high-quality feed, as distinct from low-quality feed obtained by grazing on pastures. Indeed, while sufficiency of high-quality feed has a positive effect on milk yield, reported sufficiency of grazing pastures does not have a statistically significant effect. This may be an outcome of the general tendency among dekhkans to graze their cattle on the grass verges along the roads, where feed quality is notoriously low. Thus, fully 52% of dekhkans resort to this grazing strategy, compared with just 11% for livestock farmers, which may account among other things for the farmers' higher yields.

Table 4.12. Factors determining milk yields for livestock farmers and dekhkans

	Livestock farmers	Dekhkans
Use of artificial insemination (yes/no)	+	+
Sufficiency of purchased and farm-grown feed (tons per cow)	+	+
Sufficiency of pasture for grazing (yes/no)	Not signif.	Not signif.
Human capital (experience)	+	+
"Age" of farm (years since creation of peasant farm)	(+)	(+)
Experience in agriculture (years)	(+)	(+)
Farmer's previous experience (managerial/menial position) Dekhkan's educational attainment (highest level of schooling completed)	(+)	(+)

Another interesting factor is the positive effect of human capital on milk yields: milk yields are higher when the farmer or the dekhkan is more experienced and has a higher educational attainment. In our view, the human capital variables are proxies for the farmer's willingness and ability to maintain a comfortable and healthy environment for his livestock: a certain level of education and experience is required before one realizes that animal health and general care are as important as feeding.

Not surprisingly, the use of artificial insemination (a binary yes/no variable) also has a positive effect on milk yields, which increase when artificial insemination is practiced. This finding is consistent with the basic conclusion in **Table 4.11**, but here it is obtained in a methodologically different way, looking at artificial insemination in combination with other factors, and not on its own as previously. The regression analysis only strengthens the previous finding related to the effect of artificial insemination.

What is the government's role in all this? The importance of quality feed suggests that the government should strive to improve feed marketing and supply channels, take care of feed quality standards and monitoring, and also encourage scientific research to develop high-yield feed crops. It is only with the assistance of science that Uzbekistan will be able to produce enough feed on its shrinking area of arable land allotted to feed crops. The positive effect of human capital highlights the role that the government should play in providing training, extension, and professional education to farmers and the entire rural population. The cost of these public services will be easily recouped through increased milk yields.

Summary of policy lessons derived from the farm survey

The following list summarizes the main conclusions of the survey analysis in the form of policy lessons for decision makers in Uzbekistan.

- Per capita family income increases with the increase of land holdings and the size of the cattle herd
- Family wellbeing improves with the increase of land holdings and the number of cattle.
- Dekhkan farms are not merely subsistence farms: despite of their small size, they actively engage in sale of milk and meat they produce
- Dekhkan milk producers that achieve higher efficiency and have more cows tend to sell a greater share of their output
- Artificial insemination has a positive effect on milk yields
- Feed sufficiency and animal care increase milk yields

5. Conclusions and policy recommendations

The livestock sector contributes more than 40% of gross agricultural output in Uzbekistan, supplementing cotton and wheat – the country's two main cash crops – as the pillars of the national food-security program. Livestock is an important source of income for rural families, contributing according to the 2007 survey around 10% of family's total income for dekhkan households.

Yet the livestock sector in Uzbekistan suffers from an anomalous skewed structure: virtually all the cattle and dairy cows are in small dekhkan farms, with 1 or 2 animals per rural family. Milk production does not exceed 5 kg per day – one pail of milk partly consumed within the household and partly sold in the market or to nearby dairies. And yet it is these one-pail-a-day farmers that sustain the dairy market in Uzbekistan: according to informed estimates from the managers of the Nestle Company in Namangan and Tashkent, 85% of milk sales are from such small family producers.

The small dekhkan farmers suffer from abysmally low milk yields – less than 1,000 kg per cow per year. This is the result of the dekhkan's reluctance or inability to resort to advanced veterinary and extension services, including artificial insemination, animal health care, and guidance or advice by livestock extension agents. No less important is the grossly inadequate feed situation: the low quality of animal feed that dekhkans can purchase is a serious obstacle to yield improvement.

The main policy recommendation of this study is therefore to improve the infrastructure of the livestock sector, including feed quality, feed distribution, artificial insemination, and animal health. It is not sufficient to create service points for the physical factors of production: it is additionally essential to train and deploy extension agents and livestock specialists that will teach and encourage the dekhkans to adopt better production practices in the interest of increasing yields and incomes. Simultaneous creation of two distributed networks – a network of service stations and a network of extension units – must be immediately implement to produce short term benefits.

Longer-term plans and policies should aim to improve the overall production and marketing efficiency of the livestock sector by correcting its skewed structure. This was basically the idea behind the efforts to create livestock farmers, i.e., operators with 50-100 cows that should be able to produce and market more efficiently than one-cow dekhkans. However, livestock farmers today are a tiny minority: 9,000 farmers with about 5% of all cattle. Instead of creating livestock farms with 50-100 cows from scratch, a better policy is to enable the small dekhkan households to gradually increase their herd from 1 cow to 5 cows, then perhaps to 10 cows, and so on, until they reach the limits of their managerial capacity and skills. Not every dekhkan household will grow in this way, but many will take advantage of the policy so as to improve their well-being.

This policy requires a focus on animal feed: one cannot expect efficient dairy production with 5-10 cows, especially the animals are sent to graze on stubble in the fields or on dusty grass verges along the roads. To produce feed, dekhkans need more land – more than the maximum of 0.35 hectares of arable land that they are allowed in law today. It is unpractical to rely on feed purchases from farmers who grow feed crops: there are too many obstacles in Uzbekistan for smooth operation of this system. It is therefore absolutely essential to re-evaluate the existing land allocation procedures with the intent of finding a scheme to distribute more land to dekhkans for feed production. As our study has shown, more land and more animals are bound to increase the incomes and improve the wellbeing of the rural population.

An interim solution for increasing land under feed crops without revamping the land allocation procedures is by abolishing state procurement contracts for cotton and wheat or at least by abandoning the current rigid practice of setting the land areas that must be allocated to cotton and wheat. The state procurement contracts, if not abolished entirely, should specify only the quantities of cotton and wheat that farmers have to sell to the government, without specifying the area of land to be reserved for these crops. If farmers are given the opportunity to optimize the cropping pattern (the "freedom to farm" principle), they will have a greater incentive to produce the prescribed quantities of cotton and wheat for government procurement on less arable land. As a result, significant areas of land would be released for other crops, including feed crops such as corn and alfalfa, thus providing a sufficient feed base for larger household herds. More animals, just like more land, is bound to raise family incomes and improve the wellbeing of the rural population.

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All data used in Section 4 are based on the farm-level survey carried out for UNDP in August 2007 by Tahlil Sociological Research Organization in Tashkent.

The description of the reform processes in Section 2 draws on a background report (in Russian) prepared in the summer of 2007 by Aleksandr Chertovitskii and Odil Akbarov from TIIM – the Tashkent Institute of Irrigation and Melioration.

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