

INTAS Research Project on Agri-food Industry Restructuring in Ukraine and Moldova (AFIRUM)



Overcoming supply chain failure: a Moldovan case study of agri-food industry recovery

**Working Paper No.5
Revised 2005**

Matthew Gorton, Mikhail Dumitrashko and John White

For correspondence:

Matthew Gorton, School of Agriculture, Food and Rural Development, University of
Newcastle, Newcastle upon Tyne. UK. Email: matthew.gorton@ncl.ac.uk

Overcoming supply chain failure: a case study from Moldova of agri-food industry recovery

Matthew Gorton^{a*}, Mikhail Dumitrashko^b and John White^c

^a School of Agriculture, Food and Rural Development, University of Newcastle, Newcastle upon Tyne, NE1 7RU, UK

^b Institute of Management and Rural Development, Chişinău, Moldova

^c Plymouth Business School, University of Plymouth, Drake Circus, Plymouth, Devon. PL4 8AA, UK

ABSTRACT

Successor states of the Soviet Union have witnessed substantial falls in agri-food production since the break-up of the USSR. Supply chain disruption has been a major factor in this decline. This paper identifies how asymmetric information between farmers and processors led to market failure in Moldova and how one dairy company has attempted to overcome such a crisis. The case study company has invested in better monitoring of milk quality to effectively supervise transactions. Milk production is a major source of income for rural households who sell to dairies via village collecting stations. The costs of monitoring milk quality to avoid market failure from adverse selection are significant. Preventing small-scale producers being marginalised from dairy supply chains is an important factor in safeguarding and improving rural livelihoods.

Acknowledgement

This research was funded as part of an INTAS research project considering agri-food industry restructuring in Ukraine and Moldova (INTAS99-00753). The authors are grateful for the advice of Anatolie Ignat, Mark Toon and three anonymous referees for their helpful comments. The usual disclaimer applies.

1. Introduction

The transition from centrally planned to more market based economies in Central and Eastern Europe (CEE) and the Former Soviet Union (FSU) has been characterised by significant falls in agri-food production (Lerman, 2001). A number of reasons have been identified for this fall, such as the greater international contestability of markets, a fall in real protection, a cost-price squeeze and the disruption caused by land reform and privatisation programmes (Macours and Swinnen, 2002; Swinnen and Gow, 1999). In overcoming disruption it is important to take a supply chain perspective to identify ways in which the new market actors that have emerged from transition can develop successful relationships, to exploit the inherent competitive advantages that many states appear to possess for some agricultural commodities (Keyser, 2004).

This paper identifies how supply chain disruption, with a high level of asymmetric information between farmers and processors led to market failure in Moldova and documents how one dairy company has attempted to overcome such a crisis and the problems that remain. The strategies employed by the case study firm to rebuild relationships with farmers are evaluated. Notwithstanding some notable exceptions (Dries and Swinnen, 2004), the rebuilding of farmer – processor relationships in CEE-FSU markets has received surprisingly scant academic attention despite the implications for rural welfare of how these relationships are reconstructed. The paper is split into five sections, the next section details the disruption to supply chains that occurred with food industry privatisation and land reform and how milk markets became subject to problems of adverse selection. Section 3 presents an overview of the case study company. The evolution of the firm’s procurement policy is detailed in Section 4, with relevant conclusions drawn in Section 5.

2. Supply Chain Disruption in the Dairy Sector and Market Failure

During the communist period, the FSU encompassed both formal and informal food supply channels. *Formal* supply channels were characterised by a high degree of vertical co-ordination, managed by central planners and linked large state (*sovkhov*) and collective (*kolkhoz*) farms with state-owned food processing plants (*kombinats*) and retail co-operative and distribution systems. Production targets, prices and the mix of products were all controlled through the planning process with the state managing contract enforcement. Given the role of the state in directing resources, there was no effective competition between processors for the available raw materials (Wegren, 1996). These formal channels were supplemented by *informal food production* by households on auxiliary private plots, the output of which was mainly used for self-consumption.

As part of the USSR, the agri-food sector dominated the Moldovan economy: in 1991 agriculture and the food industries accounted for 43 per cent of GDP and employed just over 50 per cent of the active labour force (ARA, 1998). During this period, agricultural production was dominated by about 850 collectivised agricultural enterprises, of which 470 were *sovkhovi* and the remainder *kolkhozi* (Dumitrashko, 1997). The average size of the *sovkhovi* and *kolkhozi* was approximately 2,000 and 3,000 hectares (ha) respectively.

During the 1990s, most CEE-FSU states embarked on the privatisation of formal agri-food channels. In the dairy sector this often resulted in the break-up of the large livestock herds managed by the state and collective farms that previously supplied state-owned dairy processors. As a result, a large drop in milk production in the region was witnessed.¹

¹ While all FSU states suffered marked declines in milk production in the decade following the break-up of the Soviet Union, analysis of FAOSTAT data (2004) for the period 1991-2003 indicates that Moldova registered the worst relative decline of all the former Soviet Republics.

Table 1 comparatively analyses the evolution of milk production in Moldova for the years 1991 to 2003 and for the latter date compares Moldova against the two largest producers in Central Europe (Germany and Poland) and its neighbouring countries (Romania and Ukraine). Moldovan milk production fell from 1.5 million tonnes in 1991 to 600,000 tonnes in 2003. The collapse in output came from the disbandment of the *sovkhozi* and *kolkhozi*: over the same time period the output of agricultural companies (the collective farms and their successors) fell from 1.23 million tonnes to 34,000 tonnes. This implies that by 2003, households accounted for 94 per cent of milk production. The drop in milk production has outstripped the fall in the number of cows due to decreasing productivity. Yields are low in Moldova, averaging approximately 2,000 litres per cow per annum, below those achieved not only in Central Europe but also those reported for Romania and Ukraine. Since 2001, the average yields of agricultural companies have been higher than those of rural households but the differential is less marked than what might be expected: in 2003 the average yields of agricultural companies and rural households were 2,561 and 2,056 litres per cow per annum respectively. Despite the collapse in output, Moldova is still a net exporter of dairy products albeit with fairly small and erratic volumes. Most of this trade is to Russia and Ukraine, for low value added skimmed milk powder, and less importantly, cheese.

TABLE 1 ABOUT HERE

An important determining factor of the fortunes of the Moldovan dairy sector has been the land reform programme that was implemented in the late 1990s, which envisaged the complete distribution of the land and physical assets of collective farms to their members (Csaki and Lerman, 2002). However, the outcome of the privatisation process has been far from uniform. The large former *sovkhov* and *kolkhoz* farms within which members were informed about the possibilities and

methods of land privatisation were largely disbanded, together with the agricultural enterprises which had financial difficulties and where the farm directors did not resist the privatisation process. However, in some cases directors did resist the reform process and as a delaying tactic they created other enterprises based on their *kolkhoz* or *sovkhov* such as joint stock companies, production co-operatives and associations of peasant farms. In these cases, the privatisation process often did not see a large transfer of property to members and in some cases only the name of the enterprise effectively changed. The managers of these enterprises are the ex-directors of the *kolkhozi* or *sovkhovi* and several have kept their animal breeding activities. There were also some cases of former collective farm directors, veterinarians and zoo-technicians (or a team of some of these specialists) being able to convince the farm's members to keep their shares together. In these instances either the large farm was not disbanded or a new, smaller joint-stock company specialising in livestock was created. The quality of the management of these successor companies, however, varies enormously: some remain wedded to Soviet era practices, some are corrupt or bankrupt, while others have enthusiastically sought to exploit new market opportunities. The new 'farms' that appeared where the *kolkhozi* and *sovkhovi* were fully disbanded average 1.4 ha in size with farmers typically owning only 1 or 2 cows, which they possessed prior to privatisation or, less commonly, which they received as a result of privatisation.

These reforms have meant that in Moldova there are currently two main types of milk producer: (a) agricultural companies and (b) rural households (Figure 1). Agricultural companies sell directly to dairies while rural households, where they market their output, sell at village collecting stations. The agricultural companies, despite having their origin in the former collectivised farms, operate on a smaller scale than the latter did in the Soviet period, typically having between 50 and 100 cows. However, there is official data on the distribution of herd sizes for neither agricultural companies nor rural households. To gain an insight into the structure of the dairy herds kept by rural households, data has been extracted from a survey conducted in 2003 by

one of the authors as part of a separate project. The survey covered households in four rural villages, in each of the seven regions of Moldova west of the Nistru River.² The 28 communities surveyed accounted for just under 34,000 households and 4.5 per cent of the total population in Moldova. The data relating to dairy farming is presented in Table 2.

TABLE 2 ABOUT HERE

Table 2 highlights the extremely fragmented nature of household dairy production. Slightly greater than 40 per cent of rural households are engaged in milk production but the vast majority of these (81.7%) have just one cow. Only 12 households had more than five cows with largest herd size being 8. The households with 5 or more cows accounted for less than 0.5 per cent of the total animal stock.

There is no clear data on the proportion of milk produced by rural households that is marketed. However, Keyser (2004) states that only 20 per cent of the total milk produced in Moldova is marketed. Based on the production data in Table 1 and assuming that all the output of agricultural companies is sold, it is therefore implied that just 15.1 per cent of the milk produced by rural households is marketed. However, milk processors and other dairy supply chain actors interviewed on this question believed this to be a significant underestimate, arguing that a high proportion of milk transactions are unregistered to avoid tax. Given the nature of these transactions precise data is not forthcoming; however one dairy co-operative revealed that they source milk even from households with just a single cow. This co-operative estimated that in 2003, 90 per cent of the 330 tonnes of milk they sourced via collecting stations came from farmers with a single cow, with approximately 100 households supplying each station. The importance of this small-scale milk

² Transnistria was excluded.

production is common to many other CEE-FSU states (Dries and Swinnen, 2004), but the degree of fragmentation in Moldova is particularly acute.

Keyser (2004) has assessed the profitability of small-scale milk production in Moldova. He evaluated the profitability of 2, 5 and 10 cow herds under typical and improved management practices, where the latter refers to the returns of those using improved feed regimes and animal husbandry practices (Table 3). The net profit of 2 cow farms using typical production methods, assuming they market their output, was estimated to be €90 per year. With improved management, returns were estimated to be €629 per year. Households with 5 cow herds could achieve net profits of €565 and €2,518 per year using typical and improved management practices respectively. While these figures may look modest they should be assessed against average rural incomes. In 2003 the average disposable income per person per month in rural areas was estimated to be €26.97 (*Ministerul Economiei, 2005*). According to the same reference, the average agricultural wage in 2003 was €38.52 per month. These figures suggest that even very small dairy herds are a relatively important income source in Moldova. While the structure of herds implies that most dairy farming in Moldova is unproductive, failing to realise economies of scale, the sector nonetheless provides fairly equitable potential transfers to over 40 per cent of rural households. This is important for poverty alleviation - market transfers occur to a remarkably high proportion of rural households in a country which is both officially ranked as Europe's poorest and lacking an adequate system of social security (*Ministerul Economiei, 2005*).

TABLE 3 ABOUT HERE

At the dairy processing level restructuring has also occurred. The large state-owned *kombinats* have been privatised and they face new competitors - emerging small-scale farmers that have forwardly integrated, domestic traders and, in some cases, foreign investors (Gorton *et al.* 2003).

While the dairy sector is an important source of income for rural households, milk procured via collecting stations presents four main problems. Firstly, such milk tends to have high total bacterial counts caused by contamination (dirty equipment, lack of mastitis control measures) and the absence of adequate cooling and cold storage facilities. Secondly, transaction costs are high as relatively small payments are made to a large number of actors. Thirdly, the output from small-scale producers is highly seasonal, so if dairies collected milk only from such actors their activity would be highly erratic. Finally, many collecting stations in Moldova, as elsewhere in the FSU, are poorly equipped to monitor the quality of milk purchased. This has led to asymmetric information between buyers and sellers regarding product quality, as presented in Akerlof's (1970) market for 'lemons'. Akerlof famously demonstrated that when agents on one side of a transaction are better informed, some markets may entirely fail to emerge as bad quality goods drive out good ones. Drawing on this, Levin (2001) theoretically establishes that improving the buyer's stock of relevant information in such an adverse-selection market, i.e. making private information public, unambiguously improves trade so long as market demand is downward sloping.

3. Evolution of the Case Study Enterprise

The dairy processor Molmilk³ is located in Central Moldova and is the focus of this paper. Molmilk was chosen because it is a domestically owned enterprise that has recovered from a severe crisis by restructuring its procurement procedures and grown despite a difficult operating environment. The factory was established in 1992 by the state and was fully privatised as a joint stock company in 1996. The capacity of the dairy is fairly small (50 tonnes of milk can be processed per day). During the period between 1993 and 1996 it operated at approximately half its full capacity, pasteurising milk supplied by local *kolkhozi* and produced a range of processed dairy products. The break-up of the collective farms severely disrupted its supply relations and between 1997 and 1998 just 500 kg

of milk was processed per day and employment fell from 57 people in 1993 to 11 in 1997. The future of the plant was in severe jeopardy and Molmilk was not alone in this problem. In comparison with the period between 1985 and 1990, when 10 milk factories operated in Moldova, by 1999-2000, 5 had ceased production completely and the remaining 5 plants operated at a fraction of their capacity (10-15 per cent).

Table 4 documents the performance of Molmilk for the period 1999-2003, recording changes in output, the quality of milk procured and the number and typical yields of suppliers. Table 4 highlights that Molmilk has steadily rebuilt production. In 1999 the plant procured a mere 98 tonnes of raw milk but this rose to 874, 1,905 and 2,300 tonnes in the years 2000, 2001 and 2003 respectively. The figure for 2003 is still less than what Molmilk recorded in 1993 but it nonetheless represents a notable recovery compared to the late-1990s. Employment has also steadily recovered.

TABLE 4 ABOUT HERE

Since 1999, the yields of both the agricultural companies and rural households that supply Molmilk have risen and remain well above the average for Moldova (as detailed in Table 1). For example the average yields for the agricultural companies and rural households supplying Molmilk were estimated to be 3,500 and 2,800 litres per cow per year in 2003 compared against national averages of 2,561 and 2,056 respectively. The quality of milk has also improved. The proportion of total milk supplied to Molmilk that was rejected or classified as unusable fell from 4 per cent in 1999 to 1 per cent in 2003 and the proportion of milk graded as first class rose in the same timeframe from 66 to 90 per cent. No milk is graded or paid a premium as extra class due a lack of perceived demand for such quality and this is discussed further in Section 5.

³ The fictitious name of Molmilk has been chosen to protect the anonymity of respondents.

The number of agricultural companies supplying Molmilk rose from 6 in 1999 to 16 in 2003. Up to 2001 the proportion of supply accounted for by rural households decreased. However more recent improvements in procurement practices have led to an increase in the percentage of total milk procured from rural households, rising from 16.6 per cent in 2001 to 35 per cent in 2003. The next section analyses how Molmilk tackled its procurement problems and what difficulties remain.

4. Procurement Policy

When the majority of collective farms were disbanded, Molmilk was forced to rely on rural households for its main raw material, sourced via village collecting stations. These collecting stations were established in the mid-1990s and were initially poorly equipped to evaluate the quality of milk but payments were made to suppliers on the spot. After payment, the collected milk was poured into 49 litre tanks and sent to the factory. However, as collecting stations were poorly equipped to measure milk quality, farmers could exploit information asymmetries between themselves and the dairy. In Moldova, five specific cheats perpetrated by either sellers or buyers of milk have occurred:

- (a) Passing off contaminated milk as fresh,
- (b) Adding water to milk where payment is based on volume,
- (c) Adding lard to milk where payment is based on fat content,
- (d) Adding sheep's milk to cows' milk,
- (e) Defecting on paying farmers for milk (late or non-payment).

In 1998 approximately 20 per cent of milk procured by Molmilk from collecting stations was deemed to be unusable. This was milk that Molmilk had paid for at the collecting stations but was wasted due to cheating and the losses incurred further jeopardised the company's survival. However as a result of the strategies adopted by Molmilk, which are discussed below, this has fallen significantly: in the years 1999, 2001 and 2001 the percentage of milk procured via collecting

stations that was rejected or classified as unusable was approximately 9, 7 and 3.5 per cent respectively.

To cope with its procurement problems, Molmilk employed a two-pronged strategy. First, it sought to increase the number of agricultural companies which supplied it, by introducing more effective contracting. Second, it sought to raise the quality of milk procured through collecting stations. These initiatives were tied to a marketing strategy that saw Molmilk's future, as a medium-sized dairy by national standards, in increasing its proportion of value added dairy products, particularly cottage cheese and dairy confectionary. For these products the fat and protein content of milk is critical.

Contracting with Agricultural Companies

Given the difficulties of procuring milk from rural households, the most attractive source of raw milk are, in general, the joint-stock companies because they hold larger herds, employ better feeding regimes and mechanised milking, and possess cooling facilities. To increase the number of agricultural enterprises that supply them with milk, Molmilk has had to try to formulate robust contracts with such actors. Molmilk has been successful in this: in the period 1998 to 2003 the number of commercial milk enterprises that supply Molmilk increased from 2 to 16. Each of the joint-stock companies that supply Molmilk possess between 25 and 150 milking cows.

The factory formulates and agrees contracts with all its direct suppliers on an annual basis. The contracts between the factory and such suppliers specify prices (based on a fat content of 3.5 per cent) and payment terms but contain no exclusive supply clauses. In the case of unforeseen changes in market conditions an additional annex for each contract is drawn up. Thus although contracts specify a price, this is not binding when market conditions change. Due to macroeconomic instability and relatively high inflation farmers have been very unwilling to sign contracts that lock

them into selling at a predetermined future nominal price. Moreover, farmers in Moldova often cancel contracts when they receive a higher offer price. Molmilk has suffered from this but to a lesser extent than many other dairies: in the period from 2001 to 2004 it suffered from just one case (in 2002) but later the contract was re-established as the new processor to which the producer had switched failed to pay on time.

As part of its contracts, Molmilk offers two additional benefits to its larger suppliers. First, payments are made promptly (weekly) and contracts stipulate that if Molmilk fails to pay on time it has to pay a penalty based on the market price of the milk to the commercial supplier. Prompt payments are considered to be essential for retaining, and attracting other, large-scale suppliers. Second, Molmilk has leased new milk cooling tanks to 3 commercial suppliers to improve the quality of raw material and has offered such a facility to all its large scale suppliers. The costs to the producers of leasing the cooling tanks have been offset by the high prices they have received for their milk achieved through a bonus (and penalty) system or higher (and lower) quality output. For these three dairies the proportion of first class milk produced rose from approximately 60 per cent in 2001 to 90 per cent after the leasing agreements were implemented.

If producers try to cheat by selling counterfeit or substandard milk the offending material is returned to the producer rather than resorting to legal action because the costs of the latter are regarded as prohibitive. Milk supplied that fails to meet the minimum standards laid down in contracts is also returned to producers. Between 1999 and 2003 there were 7 cases of milk being returned to large-scale producers (4 cases in 1999, one case in 2000, one in 2001 and one in 2002). These instances were due to the milk possessing excessive ammonia. Other cases have not been recorded but about 7 per cent of the milk supplied by agricultural companies in 2003⁴ was of second

⁴ This figure is lower than that reported for all of Molmilk supplies (Table 4) as the proportion of second class milk from village collecting stations is higher.

class, the lowest grade permitted in contracts. Regarding the penalty and bonus system, contracts stipulate that milk density cannot be less than 1.027kg/m^3 and this is used as a measure of water content. If the density is lower, i.e. high water content, the price paid by Molmilk is reduced by 2 per cent. If the acidity of the milk is above 18°T (degrees Thorner), the price is reduced by 50 percent or the milk is returned to the producer. Payments are also adjusted based on fat and protein content given the importance of these characteristics for manufacturing Molmilk's value-added dairy products.

Each batch of milk from agricultural companies is tested at both the farm, in the presence of a representative of the farm and the driver of the milk tanker, and at the dairy. In this way asymmetric information, between sellers and buyers, regarding quality is avoided. An experiment of offering credit as a contract support measure, which was attempted in 1999 and granted to one large scale producer with 100 milking cows was abandoned after it was felt that the measure had no impact on raising yields or quality. The poor return to this measure was attributed to Molmilk's lack of control on how the producer used the credit. The latter problem has not been unique to Molmilk and is reported in other studies on contracting in the region (White and Gorton, 2004).

Collecting Stations

While relationships with agricultural companies are seen as preferable, collecting stations remain an important source of milk in Moldova, particularly as rural households account for 94 per cent of total output. To address the problem of cheating, in 1999, Molmilk began supplying its own collecting stations with chemical reagents to analyse fat content, acidity and density (sulphuric acid, alcohol and sodium hydroxide)⁵ so that the quality of milk could be determined for each batch of milk from every supplier. In this way, farmers that tried to sell counterfeit / substandard milk could

⁵ Sulphuric acid is used in combination with alcohol to determine the butterfat content of milk (the Gerber test). Sodium hydroxide is used in the test for acidity and is a measure of freshness.

be identified. Tests are conducted at the collecting station in the presence of the farmer. Once producers realised that each batch of milk would be tested and poor quality milk rejected, a process that took about two months, the level of (attempted) cheating fell by approximately three-quarters. Training seminars were organised in 1999 and 2000 at collecting stations to explain the changes and also to disseminate advice on improving feed regimes and animal husbandry. Senior managers estimated that this extension advice raised yields by ten per cent and also improved milk quality.

The costs of measuring milk quality are, however, proportionally higher for milk sourced via collecting stations. The material costs for testing one batch of milk's fat content, acidity and density in 2003 was approximately €0.13. For the agricultural companies that supply Molmilk, given a national average price received by farmers of €0.15 per litre and an average production of 570 litres per day, the costs of testing one day's output is equivalent to 0.001 per cent of the value of output. However for a rural household, with often no more than 1 cow, selling an average of 7.3 litres per day in season, the cost of testing their daily output is equivalent to 11.9 per cent of the value of their milk. The cost of testing is partly absorbed by Molmilk and partly reflected in differential prices offered to agricultural companies compared to small-scale farmers via collecting stations.⁶

To try to balance the importance of quality testing for establishing a market against the costs of regulating that market, Molmilk has chosen not to assess fat content, which is the most expensive test, on a daily basis but rather randomly for each farmer two to three times per month. The fat content recorded from a particular test is taken into account in the level of payment a farmer receives⁷ for that particular batch and for future batches until the next random test is conducted. As the farmer is unaware of when the next test will occur, cheating is curtailed but farmers who receive

⁶ Precise information on prices paid to suppliers was withheld by Molmilk. Molmilk believed that rural households could continue to supply at a price inferior to that received by agricultural companies because of the former's lower costs.

⁷ 3.5 per cent fat content is set as the standard with an adjustment in the price received by farmers according to whether the level is above or below this threshold.

a worse price as a result of low fat content will often seek an alternative outlet for their milk rather than being 'locked' into the poorer rate.

None of the contracts with either the agricultural companies or the collecting stations specify the quantity of milk to be supplied. This creates uncertainty for Molmilk and it has considered backward integration into dairy farming to secure supply and better control quality. However to date it has rejected this option for two reasons. First, the measures taken since 1999 have greatly improved its supply relationships weakening the potential relative gains from backward integration. Second, it has eschewed backward integration because of a lack of management experience in dairy farming and an unwillingness to spread management's time 'too thinly'.⁸ This is consistent with Buzzell's (1983) analysis of the performance of vertically integrated companies in the USA, which identified the dangers of losing specialisation and stretching the core competencies of senior managers.

5. Conclusions and Lessons for Development Strategies

The Molmilk case illustrates a number of dilemmas that have been confronted in rebuilding farmer - processor relationships in the FSU, from which conclusions can be drawn. Firstly, land reform and privatisation programmes should take a supply chain perspective. Land reform is often treated solely within an agricultural context and the debate on transitional countries has been principally concerned with the benefits that might accrue from decollectivisation and the distribution of private property rights (Berman, 1996). Yet changes in agricultural structures can have a profound effect on the operational viability of food processors and this is clearly illustrated in the case of Molmilk.

⁸ While Molmilk has rejected this option another major producer in Moldova, Lapte, has bought pastures and a dairy farm to gain greater control over the quantity and quality of its supply.

Successful supply chains require both suppliers and buyers to have the ability to evaluate quality in order to avoid adverse selection problems. Where asymmetrical information persists between buyers and sellers, as occurred at Moldovan milk collecting stations, opportunities for cheating will emerge. This problem is often overlooked in the development literature and was not discussed in Moldova at the time of land reform. Nevertheless it led to market failure and put the viability of whole supply chains in doubt.

Rebuilding relationships between processors and commercial dairy farmers also requires the development of self-enforcing contracts. In an environment where the public enforcement of business contracts has broken down, the ability to form and maintain private, self-enforcing contracts becomes paramount (Gow and Swinnen, 1998; Gow and Swinnen, 2001). Prompt payments, transparent terms and selective benefits, such as the leasing of cooling tanks have been important elements in building self-enforcing relationships between Molmilk and agricultural companies. Despite the turbulence of the Moldovan market, remarkably few cases of cheating / sub-standard supplies were reported for recent years by Molmilk.

Contracting is also an important tool for processors to influence the quality and specification of raw materials available for sale. This is particularly important where producers adopt a differentiation strategy and seek to improve the value-added of their production. The system of bonuses and penalties has had an important impact on raising milk quality. While hardly novel, such schemes are not common in the FSU: a survey of food processors in Ukraine and Moldova revealed that only 8.3 and 15.7 per cent of firms employ quality penalties and premiums as part of their contract relationships with farmers respectively (Gorton et al. 2003).

While Molmilk's is in a stronger position than in the mid- to late-1990s, a number of problems remain which are typical of post-Soviet markets. First, domestic incomes remain low⁹ and export markets underdeveloped, limiting the scope for adding value. Molmilk's target has been to maximise the milk it sources of first class, rather than extra class quality, due to the perceived weakness of local demand. While GDP growth has been relatively high in Moldova in recent years, averaging 6.65 per cent between 2001 and 2004, much of this has come from remittances from abroad and income growth has been very uneven. Some growth has also been witnessed in the milk sector: during the years 2001-2004 the value of domestically marketed dairy production grew by 5.2 per cent in real terms (*Ministerul Economiei*, 2005). Growth has been greatest in the capital, Chişinău, which is Molmilk's main market. Opportunities for adding value do exist but these are limited and most consumers remain very price sensitive.¹⁰

Second, village collecting stations are an important source of income for a large proportion of the rural population. However to function properly collecting stations have to be able to test properly the quality of milk offered. The costs of undertaking these tests are significant for small batches of milk. To date Molmilk has been relatively successful in improving the balance between the need to monitor milk quality and the costs of regulating the market. However the mid to long-term future of collecting stations remains unclear - on the one hand, in the Molmilk case the proportion of milk sourced via collecting stations actually rose during the period 2001-2003. However, given the costs of testing milk quality, the processor's relationships with rural households currently depends on them accepting lower prices than those agreed with agricultural companies and the small relative output of the latter. While testing has improved the quality of milk sourced from collecting stations it still remains below that of the agricultural companies. The future existence of village collecting stations will therefore depend on the development of other income generating

⁹ In 2004 the average wage was €84 per month (*Ministerul Economiei*, 2005).

opportunities in rural areas and whether: processors raise minimum quality thresholds, the output of agricultural companies rises significantly and / or a substantial number of rural households expand their herds. If the growth envisaged in the last two factors is witnessed, given the persistence of limited local demand, the remaining smallest suppliers are likely to be marginalised from the rebuilt supply chains. Given the data presented on the structure of herds rural incomes, if remaining small-scale producers do lose market access this will have a substantial, adverse effect on their welfare and the equity of rural incomes, especially given the weakness of the non-farm rural economy in most of the FSU.

References

- Akerlof, G.A., 1970. The market for “lemons”: quality uncertainty and the market mechanism. *Quarterly Journal of Economics* 84, 488-500.
- ARA, 1998. Moldova: Politica Agrară Actuală: Evoluție, Probleme, Sugestii 1997-1998. Agenția Pentru Restructurarea Agriculturii, Chișinău.
- Berman, B. 1996. Moldova-First Agriculture Project: Appraisal Report. Project ID No.MDPA8556. The World Bank, Washington D.C..
- Buzzell, R.D. (1983) Is vertical integration profitable? *Harvard Business Review* 62(1), 92-102.
- Csaki, C. and Lerman, Z. 2002. Land Reform and Farm Restructuring in Moldova: A Real Breakthrough? *Problems of Post-Communism* 49 (1), 42-52.
- Dries L. and Swinnen J.F.M. 2004. Foreign direct investment, vertical integration and local suppliers: evidence from the Polish dairy sector. *World Development*, 32 (9), 1525 - 1544.
- Dumitrashko, M. 1997. Review of needs and potential for farm and farming systems data in the Republic of Moldova. Paper presented to the FAO SEUR Seminar on farm and farming systems data needs in Central and Eastern Europe, Budapest, 15th-19th December.
- Dumitrashko, M. 2003. Survey of rural households. Institute of Management and Advanced Training in Agribusiness (IMATA), Chișinău.
- Gorton, M., White, J., Chernyshova, S., Skripnik, A., Vinichenko, T., Dumitrasco, M. and Soltan, G., (2003), The reconfiguration of post-Soviet food industries: Evidence from Ukraine and Moldova. *Agribusiness*, 19 (4), 409-424.

¹⁰ A small study of consumers of dairy products was conducted by Mikhail Dumitrashko in 7 retail stores in Chișinău, in the autumn of 2003. He found that when questioned on why they had bought a particular product the overwhelming response of consumers was “because it is cheaper”.

- Gow, H.R. and Swinnen, J.F.M. 1998. Up-and Downstream Restructuring, FDI, and Hold-up Problems in Agricultural Transition. *European Review of Agricultural Economics* 25 (3), 331-350.
- Gow, H.R. and Swinnen, J.F.M. 2001. Private enforcement capital and contract enforcement in transition economies. *American Journal of Agricultural Economics* 83 (3), 686-690.
- Keyser, J.C. 2004. Thematic Study on Comparative Advantage and Agricultural Marketing: Phase 1 Synthesis Report, Rome: The International Fund for Agriculture Development (IFAD)
- Lerman, Z. 2001. Agriculture in transition economies: from common heritage to divergence. *Agricultural Economics*, 26 (1), 95-114.
- Levin, J. 2001. Information and the market for lemons. *Rand Journal of Economics* 32 (4), 657-666.
- Macours, K. and Swinnen, J.F.M. 2002. Patterns of Agrarian Transition. *Economic Development and Cultural Change* 50 (2), 365-395.
- Ministerul Economiei 2005. Tendințe în Economia Moldovei: iunie. Chișinău.
- Swinnen, J.F.M. and Gow, H. 1999. Agricultural credit problems and policies during transition to a market economy in Central and Eastern Europe. *Food Policy* 24 (1), 21-47.
- Wegren, S.K. 1996. From farm to table: the food system in post-communist Russia. *Communist Economies & Economic Transformation* 8 (2), 149-183.
- White, J. and Gorton, M. 2004. Vertical Coordination in ECA Agrifood Chains: Evidence from the CIS. Paper prepared for The World Bank (ECSSD) project No.EW-P084034-ESW-BB, Washington DC.

Table 1: Comparative Analysis of Production Trends in the Moldovan Dairy Sector (1991-2003)

Country		Moldova						Germany	Ukraine	Poland	Romania
Year		1991	1996	1997	1999	2001	2003	2003	2003	2003	2003
Number of milking cows '000 heads	Total	395	342	319	286	269	279	4356	4620	2875	1694
	- Of which companies	296	113	85	41	15	14				
	- Of which households	99	229	234	245	254	265				
Milk production, thousand tonnes	Total	1511	682	617	589	579	594	28,350	13,340	11,892	4,852
	- Of which companies	1231	204	120	65	35	34				
	- Of which households	280	478	497	524	544	560				
Average yield of milk per cow, litres	Total	3,825	1,994	1,934	2,059	2,152	2,042	6,508	2,887	4,135	2,863
	- Of which companies	4,159	1,805	1,412	1,585	2,333	2,561				
	- Of which households	2,828	2,087	2,124	2,139	2,141	2,056				
Exports of dairy products (€m)			6.20	3.27	2.64	5.86	3.09	2,353.60	82.61	20.62	0.26
Imports of dairy products (€m)			1.44	2.14	0.32	0.83	2.48	981.60	16.72	177.00	15.35

Source: unpublished data, Department for Statistics and Sociology of the Republic of Moldova (2004); FAOSTAT (2004)

Table 2: Distribution of dairy herds in rural households, Republic of Moldova, November 2003

	Number of rural households	% of rural households	Number of cows	% of cows
Without cows	20,192	59.55	0	0.00
1 cow	12,484	36.82	12,484	81.66
2 cows	989	2.92	1,978	12.94
3-4 cows	229	0.68	753	4.93
5 or more cows	12	0.04	72	0.47
Total	33,906	100.00	15,287	100.00

Source: Dumitrashko (2003)

Table 3: Profitability of Dairy Farming by Rural Households Moldova for different herd sizes under typical and improved management

Herd size	Net Profit, (€/year)		Gross Return to Total Labour (€/day)	
	Typical	Improved	Typical	Improved
2 cows	90	629	1.73	4.44
5 cows	565	2,518	3.66	9.79
10 cows	768	4,178	4.01	11.38

Note: original data has been converted into euros for ease of comparison with other data, at the average exchange rate for 2003.

Source: Keyser (2004), p.48

Table 4: Analysis of Production and Supply for Molmilk (1999-2003)

	Unit	1999	2000	2001	2003
Number of employees	People	14	15	28	43
Average salary	Euros per month	31.44	41.23	78.43	92.70
Collected raw milk quantity, total	Tonnes	98	874	1905	2300
Of which from small-scale, householders	Tonnes	-	51.4	670	750
Products produced, of which					
Milk	Tonnes	15	6	178	250
Butter	Tonnes	0	4	0	0
Sour cream	Tonnes	0	0	40	45
Cottage cheese	Tonnes	76	129	259	350
Value of Total Output	Euros	17,499	207,119	446,835	563,700
Average yield of agricultural companies supplying Molmilk	Litres per cow per year	3,000		3,500	3,500
Average yield of rural households supplying Molmilk	Litres per cow per year	2,500		2,700	2,800
% of milk supplied to Molmilk which is of extra class quality	%			-	
% of milk supplied to Molmilk which is of first class quality	%	66		77	90
% of milk supplied to Molmilk which is of second class quality	%	30		20	9
% of milk supplied to Molmilk which was rejected / classified as unusable	%	4		3	1
Number of agricultural companies dealt with		6	7	9	16
% of total supply from rural households	%	50.0	25.0	16.6	35.0
% of total supply from agricultural companies	%	50.0	75.0	84.4	65.0

Source: Interviews with Molmilk employees (2001-2004)

Figure 1: The Structure of Dairy Supply Chains in Moldova

