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An analysis of farm support measures in the Republic of Moldova

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ABSTRACT

In the Republic of Moldova, agricultural policies aim to increase the competitiveness of its farming sector, ensure the sustainable management of its natural resources and improve the living standards in rural areas. The state is an important player, allocating financial resources for supporting agriculture and carrying out investment projects in this field. A post-investment subsidy program incentivises agricultural producers to modernise their farms and production. Farmers who have made investments in developing production and post-harvest infrastructure could benefit from subsidies for these investments and financial resources allocated by the Agency for Intervention and Payments in Agriculture. However, it is not clear how beneficial these subsidies are for agricultural producers and whether the goals formulated by policies are met. A critical challenge of policy assessment is the lack of regular surveys gathering farm-level data in Moldova. Another challenge is that the impact of some investments can only be quantified with a delay of several years.

This report results from an impact assessment study analysing the effectiveness of existing policy measures. A survey of 800 farms was carried out to realise this assessment, which provided information about the activity and investments made over several years. The team of researchers analysed the collected data to evaluate the policy measures covered by the survey. The study highlights essential facilitators and barriers to the farms' agricultural investment and business activity. The impact assessment underlined that the investment subsidies had measurable positive effects on labour, farm production and economic success. At the same time, it indicated directions for improving and rebalancing policy instruments to increase the competitiveness and sustainability of the agricultural sector of the Republic of Moldova.

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KEYWORDS

Moldova, farm subsidies, agricultural policies, impact assessment

CONTENTS

LIST OF TABLES

LIST OF BOXES

LIST OF FIGURES

1 Introduction and objectives

Moldova aims to increase the competitiveness of its farming sector, ensure the sustainable management of its natural resources, and improve the living standards in rural areas. Targeted and successful agricultural policies are essential to take full advantage of access to new markets resulting from the 2014 Association Agreement and 2016 Free Trade Area (DCFTA) between the EU and the Republic of Moldova and soothe the negative consequences of increasing competition. For this, a National Agriculture and Rural Development Strategy (2014-2020) has been launched, and several agricultural policy measures are offered to support this strategy. This report provides an overview of the current agricultural policy programme and offers a first analysis of the use and impacts of post-investment support offered to farms in Moldova.

Agricultural policies in the Republic of Moldova face the challenge of a dualistic agricultural landscape with three different organisational farm types: large farm enterprises, individual farms, and unregistered rural households. On the one hand, there is an overwhelming predominance of small-scale farms characterised by a low level of market integration. Small farms of up to three hectares make up 95% of all (around 900,000) farms. They account for about 70% of total agricultural output, thus forming an essential part of the farm sector. These farms are seen as a pool for a viable, commercially oriented family farm sector that still has to be developed in the country (Möllers et al., 2016). On the other hand, there are medium-sized commercial farms of 3 to 50 ha (around 42,000 farms) and large farms of more than 50 ha (about 3,000 farms). Agricultural policy support mainly reaches this 5% of medium-sized and large farms.

The number of farms participating in policy support measures has risen from around 4,000 in 2013 to more than 7,000 in 2018 (AIPA, 2019). However, data that would allow detailed insight into the programme's effects is lacking. Regular surveys gathering farm microdata are currently unavailable in Moldova. Therefore, a critical source for policy evaluation is missing (see e.g. Poppe & Vrolijk, 2017).

This study relies on survey data that may be seen as the first small step toward closing the gap in microdata. A survey conducted in the summer of 2021 provides a snapshot into a sample of subsidy beneficiaries and a control group of non-beneficiaries used for an ex-post evaluation of selected effects of the currently implemented policy measures. The study should be seen as a starting point for subsequent regular and structured policy assessments based on a reliable database, which will help identify successes and failures, learn from and correct mistakes, and channel efforts into the most rewarding areas. Such sound monitoring and assessment of policies are crucial for transparency and public support (Osborne & Gaebler, 1992).

2 Agricultural policy framework in the Republic of Moldova[1]

In the Republic of Moldova, over two million people live in rural areas (57% of the total population), operating around 900,00 farms. In 2020, the agricultural sector had a share of 11% in Gross Value Added (GVA). It employed 21% of the labour force.[2] Agriculture has thus a significant influence on ensuring food security, rural development, and the well-being of the rural population (Herzfeld & Lucasenco, forthcoming 2022; Möllers et al., 2016). Furthermore, agricultural and food products account for a large share of total exports in Moldova. This importance of the sector prompts the government to design the farm subsidy system to increase the competitiveness and productivity of the agri-industrial sector and improve rural livelihoods. However, low productivity in the agricultural sector remains an issue often linked to low-yield technologies resulting from a lack of investment, capital, and credits (Moroz et al., 2015). At the same time, climate change, in particular heat and water stress, is expected to impact the agricultural sector of Moldova. Addressing these and other sector problems, over the years, financial support in agriculture has been revised and adjusted (AIPA, 2020).

The National Strategy on Agriculture and Rural Development (2014-2020) has three general objectives:

1. **Increasing the competitiveness of the agri-food sector by restructuring and modernising the market**. Specifically, this objective is related to updating the agri-food chain to comply with EU food safety and quality requirements, facilitating access to capital markets, inputs and outputs for farmers, reforming the education system, scientific research and rural extension services in the agri-food sector and creating the integrated information system in agriculture.
2. **Ensuring sustainable management of natural resources in agriculture.** Specifically, this objective aims at supporting agricultural land and water management practices, supporting environmentally friendly production technologies, environmentally friendly products, including biodiversity and supporting the adaptation and mitigation of the effects of climate change on agricultural production.
3. **Improving the standard of work and living in rural areas**. The specific fields targeted under this objective are related to facilitating investments for physical and service infrastructure in rural areas, increasing employment opportunities in the non-agricultural sector, increasing incomes in rural areas, and stimulating the involvement of the local community in rural development.

[1] This section draws heavily on Zvyagintsev et al. (2021).

[2] Due to a revision of the Labour Force Survey, agriculture's share in employment dropped significantly from 39% to 21% between 2018 and 2019.

The strategy guides the structure of spending on agriculture for a seven-year period. Roughly 1.9 billion MDL has been allocated to agriculture, forestry, fishing, and hunting in the state budget. Despite an increase in total expenditures in this budget line, agriculture's share in the total budget declined from 8% (2007) to less than 4% (2018) (unpublished data by Ministry of Finance, cited in Zvyagintsev et al. (2021)). Following the OECD typology, almost all budgetary support measures would be classified as support of fixed capital formation. Averaging 2015- to 2018, more than 96% of the support measures fall under this category. Area-based coupled payments (direct payment for organic production), on-farm service payments, and payments for variable inputs (subsidies for breeding animals, stimulating the risk insurance mechanism in agriculture, stimulating agricultural irrigation) represent a minor share. Compared to the situation before 2010, when coupled direct payments, as well as subsidies for variable inputs, were much more relevant, Moldovan agricultural policy underwent a profound shift in instruments toward less distortive measures (Herzfeld & Lucasenco, forthcoming 2020)

The agricultural subsidy program is offered through the National Fund for the Development of Agriculture and Rural Environment (NFDARE).[3] This fund, and thus also the subsidies authorised through the Agency of Intervention and Payments for Agriculture (AIPA), has increased over the years (Figure 1) and has also undergone slight changes in the priority setting. Hence there is also an increasing need for well-grounded monitoring and evaluation of the programme's outcomes.

According to the Decision on the distribution of the funds of the National Fund for the Development of Agriculture and Rural Environment, the current subsidy programme is based on three main priorities mirroring the objectives of Moldova's agricultural policy described above: "Increasing the competitiveness of the agri-food sector through restructuring and modernisation" (Priority I), "Management of sustainable development of natural resources" (Priority II), and "Increasing investments in physical infrastructure and rural services" (Priority III). These priorities are reflected in the measures offered to farms in the Republic of Moldova, summarised in Table 1. All subsidies covered by the report are post-investment subsidies.

[3] The programme is based on Law no. 276 of 16.12.2016 on the principles of subsidization in the development of agriculture and rural environment, which establishes the general principles of state policies on encouraging and stimulating agricultural activities and rural development, directions for the use of financial means for agricultural and rural development (Law on to subsidy in the development of agriculture and rural environment, 2016). The Regulation on the conditions, order and procedure for granting the funds from the NFDARE implicitly establishes the support measures, as well as the conditions, order and procedure for granting funds, including the mandatory conditions necessary to obtain the subsidies, eligibility criteria, annual amount, etc. (Decision on the distribution of the funds of the National Fund for Agriculture and Rural Development, 2017).

Table 1 **Agricultural policy measures in the current subsidy programme**

Measure 1*"Investments in agricultural holdings for restructuring and harmonisation to European Union standards"*, covering the following sub-measures:
• Stimulating investments for the production of vegetables and fruits on protected land (winter greenhouses, solariums, tunnels)
• Stimulating investments for the establishment, modernisation and deforestation of multiannual plantations, including vineyards and fruit plantations
• Stimulating investments for the procurement of conventional agricultural machinery and equipment
• Stimulating investments for the equipment and technological renovation of livestock farms
• Stimulating the procurement of breeding animals and maintaining their genetic background
• Stimulating the lending of agricultural producers by commercial banks and non-banking financial institutions
• Stimulating the risk insurance mechanism in agriculture
Measure 2 ***"Investments in processing and marketing of agricultural products"***, covering the following sub-measures:
• Stimulating investments for the development of post-harvest and processing infrastructure - Packing houses and refrigerators for storing fruit, grapes and vegetables - Processing, drying and freezing of fruits, grapes, vegetables and potatoes - Processing, drying and conditioning of cereals, oilseeds, sunflowers and soybeans - Primary processing, packaging, refrigeration, freezing and storage of meat, processing, packaging and storage of milk, and analysis of honey
• Stimulating the establishment and functioning of agricultural producers' groups
• Stimulating promotional activities
Measure 3 ***"Preparation for the implementation of actions related to the environment and rural area"***, covering the following sub-measures:
• Stimulating investments to consolidate agricultural land
• Stimulating investments for the purchase of irrigation equipment
• Stimulating agricultural producers to compensate irrigation costs
• Stimulating investments for the purchase of no-till and mini-till equipment
• Supporting the promotion and development of organic agriculture
Measure 4 "*Improvement and development of rural infrastructure*"
Measure 5 "*Consultancy and training services*"

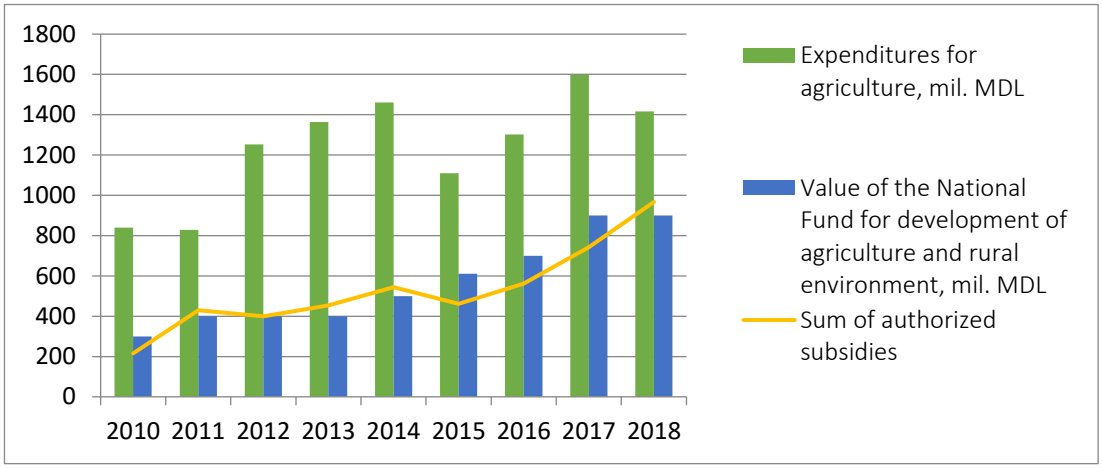


Figure 1 **Expenditures for agriculture from the state budget and valorisation of the National Fund for the Development of Agriculture and Rural Environment, 2010 - 2018, million MDL**

Source: Budget reports of the Ministry of Finance, 2010 – 2018, www.mf.gov.md; AIPA reports

Post-investment subsidies make up the largest share of support in the agricultural sector. Besides the post-investment subsidies within the original subsidy program, new types of subsidies were introduced in recent years, targeting young farmers, female farmers and migrants (subsidies in advance for start-up projects, 2018), subsidies in advance for improving the standard of living and working conditions in rural areas (2019) and direct payments per head of animal aimed at revitalising the livestock sector (2020). Since 2018 the value of NFDARE has increased from 900 million MDL to 1.2 billion MDL in 2020, of which 300 million MDL was allocated as ad-hoc support measures for agricultural producers whose production was affected by natural disasters in 2020. In 2021 this value accounted for 1.1 billion MDL (Zvyagintsev et al., 2021).

Overall, subsidies related to on-farm production-related investments (Measure 1) occupy the largest share of the budget. Support for developing and improving a range of post-harvest and processing activities (Measure 2) ranks second in relative terms. Funding for the remaining three measures increased since 2013 but never exceeded 14% of the funds. In the early phase of the programme, only Measures 1 and 2 were used. However, although the value of funds allotted to Measure 1 has increased until 2018, the situation has changed toward a greater diversity of measures (Figure 2). The still dominating Measure 1 contains the most significant number of sub-measures. Under Measure 1, the most important share of offered subsidies was directed to the sub-measures “Stimulating investments for the procurement of conventional agricultural machinery and equipment” (38.3% in 2018) and “Stimulating investments for the establishment, modernisation and deforestation of multiannual plantations, including vineyards and orchards” (32.1% in 2018) (Herzfeld & Lucasenco, forthcoming 2022). The significant share of the latter sub-measure is due to the increasing number of applications

from farmers for establishing new fruit tree and vine plantations and uprooting the old ones (AIPA, 2020).

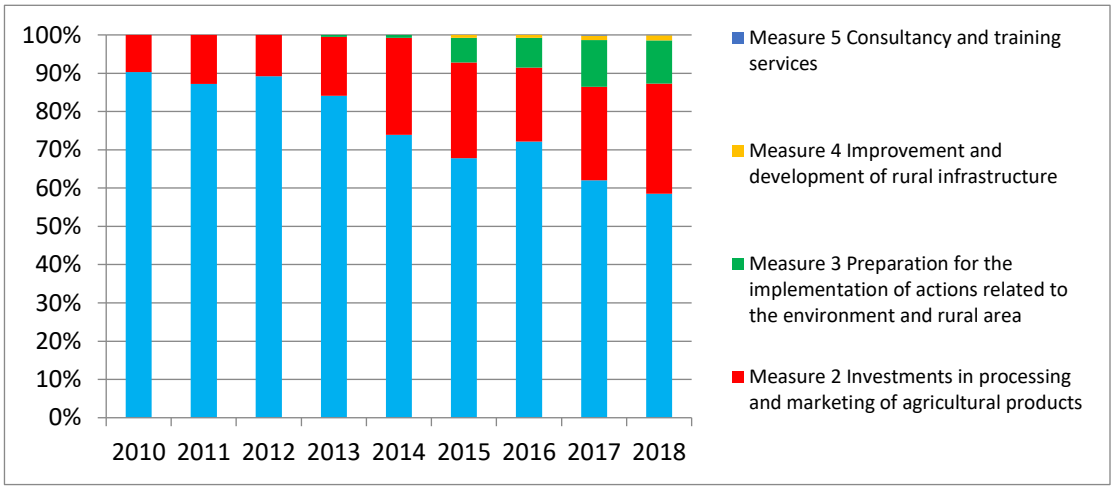


Figure 2 **General structure of the subsidy program, by measures, 2010 - 2018, %**
Source: calculations based on AIPA reports, www.aipa.gov.md

Explorative interviews of officials of MARDE and AIPA staff concerning the underlying intervention logic revealed the following exemplary objectives (see Section 3.2 for more details):

- Measure 1: Increase in domestic production and reduction of imports off-season; higher productivity
- Measure 2: Development of value chains; higher quality of products; competitiveness and increase in the number of associations; market share of associations
- Measure 3: reduction of soil erosion; improvement of environmental aspects; less dependency on weather variability; promotion of organic agriculture
- Measure 4: attraction of return migrants; increase in the number of SMEs in agriculture; development of rural tourism and rural infrastructure
- Measure 5: Increase in number of subsidy applications

The subsidy programme is strongly focused on reducing investment costs for individual farmers. As the investment support is distributed after the investment took place, support is accessible not to all farms: only farms with sufficient financial means or access to credit markets can take advantage of the (post-)investment subsidies. Support for general services flew mainly into food control activities and infrastructure development (Herzfeld & Lucasenco, forthcoming 2022).

3 Methodology and study design

This report uses a 2021 farm survey to employ state-of-the-art evaluation techniques for policy evaluation. Within the limitations of the study design, it exemplifies how better data and appropriate approaches allow for a more solid understanding of the impact of policy measures. The methodology and study design are described in this section.

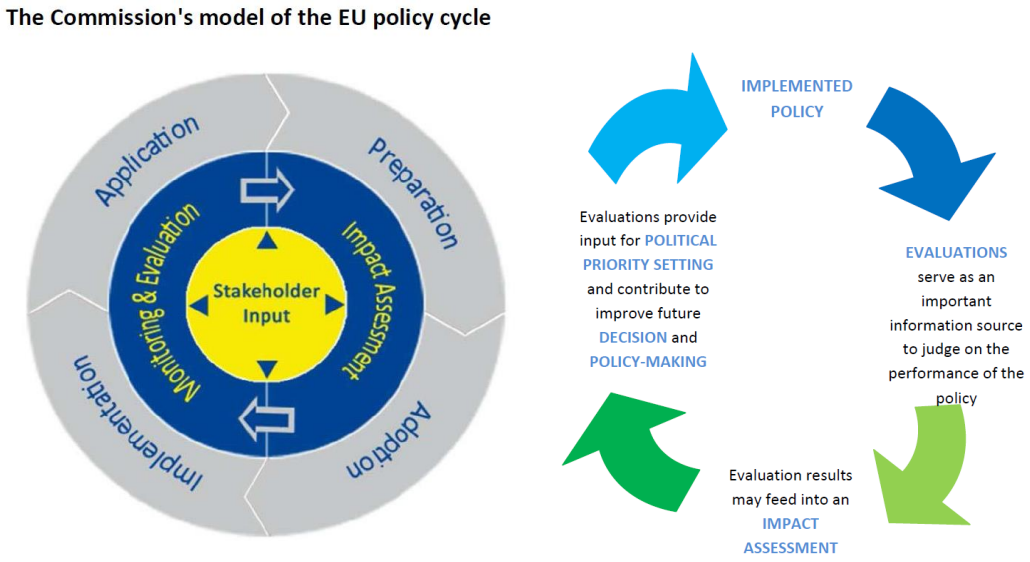
3.1 State-of-the-art in monitoring and evaluation of policies

Monitoring and evaluation are essential elements of agricultural and rural policies. They are carried out to check whether the objectives of policy intervention are reached and develop recommendations on possible improvements and political priority setting. While monitoring is a continuous task of reviewing information and, in particular financial flows, evaluation involves a judgement of interventions according to their results, impacts, and needs they aim to satisfy (European Commission, 2017b). Figure 1a depicts the EU's approach to the policy cycle; Figure 1b gives an example of what an intervention logic looks like.

In policy evaluation, which is at the core of this project, the overarching aim is to understand the *effectiveness* of the policy (the degree to which the desired outcome was reached), the *efficiency* (how the benefits of the intervention relate to the costs), and ideally also sustainability and trade-offs (e.g. between environmental and economic goals). However, such assessments are not trivial for several reasons. Impacts may be direct or indirect, intended or unintended. They may unfold in different areas, such as in the economic, social or environmental spheres. They can also occur at various levels, from the individual to the country or global level. Analytically, the aim is to compare two outcomes along with a with and without policy situation. Yet, the so-called counterfactual - the situation in which a beneficiary farm had no subsidies ("without situation") cannot be observed. This is the 'classical evaluation problem' (Pufahl & Weiss, 2009). Therefore, if not 'naïve' and crude evaluation techniques[4] are applied, not only do selection bias issues need to be addressed, but the effects of the intervention have to be disentangled from other influences. For this, relevant control groups have to be identified to estimate counterfactual outcomes.

[4] See European Communities (2014) and Michalek (2012) for a discussion of often applied, but not recommendable approaches to evaluation.

a)



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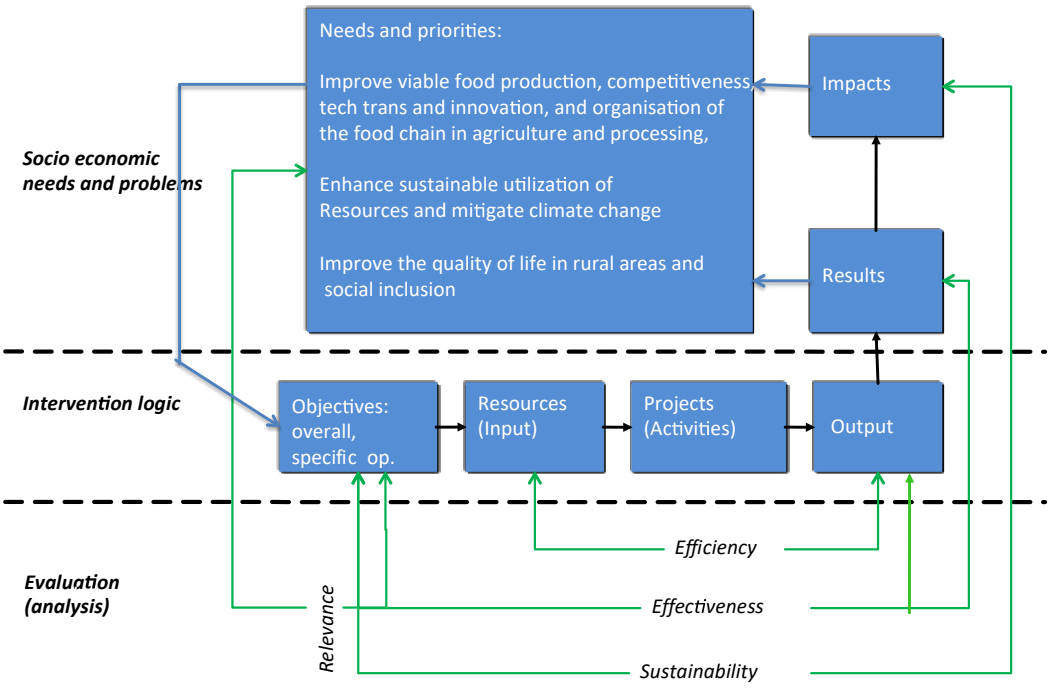

Figure 3 **Monitoring, evaluation and impact assessments in the policy cycle**

Source: a) European Commission (2017a, 2017b) and b) Kvistgaard (2016)

Econometric methods offer a range of quasi-experimental approaches to construct a hypothetical counterfactual (ex-post) after introducing a specific policy. One of the more advanced approaches to evaluating policy interventions relies on matching techniques (European Communities, 2014; Michalek, 2012). These methods, such as for example propensity score matching (PSM), are demanding in data (number of observations and quality) and require technical skills but will produce more reliable results.

PSM is an advanced and effective tool for the evaluation of policies. It is a powerful quasi-experimental approach that can be used to identify appropriate control groups to describe a counterfactual situation and estimate effects. The key idea is to find from a group of non-participants units that are observationally similar to programme participants in terms of pre-programme characteristics. The degree of similarities between these participants and non-participants is measured based on the probability of being exposed to the programme, given a set of observable characteristics (not affected by the programme), the so-called propensity score. Based on this propensity score, each participant is then matched with an observationally similar non-participant. Then the average difference in outcomes across the two groups is compared to calculate the programme treatment effect. These treatment effects are computed as ATT (Average Treatment Effect on Treated), ATE (Average Treatment Effect), and ATNT (Average Treatment Effect on Non-Treated) (Imbens, 2010).

PSM is a very flexible semi-parametric approach, which, compared to standard regression methods, is less demanding concerning the modelling assumptions (Pufahl & Weiss, 2009). It imposes few constraints on the functional form of the treatment model and few assumptions about the distribution of the error term. PSM works well if a selection bias from unobserved characteristics is likely to be negligible, but participation is affected by the unit's (farm, person, community, region, etc.) observable characteristics only. Hence, the PSM method will not generate good results if other important observable characteristics explain the differences in performance but are not included in the model or if there are unobservable characteristics explaining these differences but which are not constant over time.[5]

Implementing a PSM approach consists of the following essential steps:

(1) econometric estimation of propensity scores for policy-supported and non-supported units;
(2) checking overlap and common support region (to ensure as many matches as possible) and choosing the best matching algorithm;
(3) checking the matching quality (performing balancing tests);
(4) estimation of the policy effect

[5] Yet, various observable proxy variables can be used as controls for unobservables; when unobservable characteristics are fixed over a period of programme implementation, the effect of these unobservables can be controlled by combining the PSM with the DID method.

Two other approaches should be applied in combination with PSM or instead of PSM. First, if outcome data on programme participants and non-participants is available for both "before" and "after" periods, a combined PSM-DiD measure can assess effects at micro, regional or programme area levels. A conditional DiD estimator (PSM-DiD) may improve evaluation findings compared to a standard PSM that only uses post-intervention data. In this method, observed changes over time for the matched (using PSM) programme non-participants are assumed to be an appropriate counterfactual for programme participants. Better control of a selection bias in both observables and unobservables is possible with this approach. Second, the general propensity score (GPS) approach could be used instead of PSM in situations when (almost) all units received support from the given programme and the intensity of this support per unit (e.g. the frequency and monetary amount of subsidies) are known. In this case, the GPS approach is the most effective tool for finding counterfactuals. GPS does not require the existence of units that did not receive programme support. It further allows to estimate the average effect of the policy support on the selected outcome indicator and assess the marginal effects of the programmes/measures in question in dependence on the support intensity level obtained.

All three mentioned approaches require a relatively large amount of data because they depend on having a sufficiently large number of participant and, for PSM and PSM-DiD, non-participant observations in order to find appropriate matches and to ensure external validity (a substantial region of common support that allows for generalisability[6]). They also require a relatively large amount of data about supported units and comparison groups before the programme (for PSM-DiD and GPS also data after the programme).

Data that goes beyond the overall use of the funds as presented in the previous chapter is, like any farm micro-level data, hardly available in Moldova. In the EU, the CAP indicator framework and FADN country datasets are the critical basis for policy evaluation. As Moldova lacks comparable datasets, this project will develop a survey instrument and collect data that will provide insights into selected effects of the current subsidy programme and serve as a starting point for more detailed policy evaluation.

[6] The external validity and hence generalisability of PSM and PSM-DiD results decreases when the share of unmatched units increases.

3.2 Overview of study design

The study relies on an empirical farm survey allowing us to draw conclusions on selected impacts of subsidised investment support. For this, a key requirement was to cover subsidy recipients and non-recipients to create a counterfactual scenario (see Section 3.1). The sampling of between 600 and 800 farm units was discussed with the national counterparts and experts. The sample should not only be regionally representative (as far as possible) but cover a sufficient number of recipients of all relevant measures.[7]

Data from 2018 were used to identify those measures with the highest number of beneficiaries. In total, 5,812 applicants - 50% - small farms, 36% - mid-size farms and 14% - large farms - received subsidies during year 2018 (Table 2). The beneficiaries benefitted from the 24 support measures and sub-measures (Table 3). It is important to note that the size categorisation used here focuses on the commercial farms participating in the subsidy programme.[8] We use this categorisation solely for the sampling.

Table 2 Distribution of beneficiaries by farm size in Moldova (2018)

Self-reported farm size8	Total units	%	Sample size, units
Small	2,886	49.65	397
Mid-size	2,115	36.39	291
Large	811	13.96	112
Total	5,812	100.00	800

[7] Ideally, the selected farms should be representative in terms of their farm type and size as this would be in line with the EU FADN database, which is supposed to be representative in the dimensions region, economic size and type of farming (Kelly et al., 2018).

[8] According to the Law no. 276 from 16.12.2016 on the subsidy principles in the development of agriculture and the rural environment, the following classification of agricultural producers is made:

- small agricultural producer - agricultural producer who owns with the right of ownership or possession and use up to 20 hectares of arable agricultural land and / or up to 10 hectares of land occupied by perennial crops bearing fruit or from 21 to 40 cattle or from 51 to 100 heads of pigs, sheep / goats, and, in any case, does not exceed the criteria established for the small enterprise by Law no. 179 of July 21, 2016 on small and medium enterprises;
- medium agricultural producer - agricultural producer who owns with the right of ownership or possession and use from 20 to 500 hectares of arable agricultural land and / or from 10 to 75 hectares of land occupied by perennial crops bearing fruit or from 41 to 100 head of cattle or from 101 to 240 heads of pigs, sheep / goats and, in any case, does not exceed the criteria established for the medium-sized enterprise by Law no. 179 of July 21, 2016 on small enterprises and medium;
- large agricultural producer - agricultural producer who owns with the right of ownership or possession and use more than 500 hectares of arable agricultural land and / or more than 75 hectares of land occupied by bearing fruit perennial crops or more than 100 heads of cattle or 240 heads of pigs, sheep / goats and, in any case, exceeds the criteria established for micro, small and medium enterprises by Law no. 179 of July 21, 2016 on small and medium enterprises.

Table 3 **Distribution of subsidies by measures in Moldova (2018)**

Measures	Farm size			Total, units	%	Sample size, units
	Small	Mid-size	Large			
1.1	39	14	5	58	1.00	
1.2-A	3	6	0	9	0.15	
1.2-D	307	126	49	482	8.29	
1.2-P	306	106	17	429	7.38	
1.2-S[9]	12	16	8	36	0.62	
1.2-V	164	42	14	220	3.79	
1.3	882	728	234	1844	31.73	
1.4	96	52	7	155	2.67	
1.5	35	10	7	52	0.89	
1.6.1	44	47	13	104	1.79	
1.6.2	13	21	15	49	0.84	
1.6.3	46	106	77	229	3.94	
1.6.4	3	17	4	24	0.41	
1.7	710	565	180	1455	25.03	
1.7-A	7	25	49	81	1.39	
1.8	0	1	1	2	0.03	
1.9	0	1	0	1	0.02	
2.1	1	0	1	2	0.03	
2.2	118	78	29	225	3.87	
2.3	16	17	5	38	0.66	
2.4	36	106	80	222	3.82	
2.5	18	10	3	31	0.54	
4	22	16	11	49	0.85	
5	8	5	2	15	0.26	
TOTAL	**2886**	**2115**	**811**	**5812**	**100.00**	**800**

Thus, four measures (highlighted in green) covered over 72% of the beneficiaries. Four additional measures accounted for 15% of beneficiaries (highlighted in yellow). Finally, subsidies

[9] Plantation of berries can be added to 1.2-P – plantation of orchards.

for livestock producers (1.4 and 1.5 in light green) represent a strategically important area as further subsidies (i.e. direct payments for livestock) have been introduced. Summing up, these ten measures covered roughly 91% of the beneficiaries. In terms of budget, these measures accounted for 70% of the payments distributed in 2018. Therefore, the survey concentrated on the measures stimulating diverse investments: establishment, modernisation and deforestation of multiannual plantations (1.2 D, 1.2 P, 1.2 V), procurement of conventional agricultural machinery (1.3), equipment and technological renovation of livestock farms (1.4), procurement of breeding animals (1.5), and purchase of irrigation and no-till equipment (2.2, 2.4) as well as stimulating the lending of agricultural producers (1.7).

Stratified random sampling was applied to reach a sample as close as possible to representing the Moldovan agricultural sector, whereby it includes a sufficient number of subsidy recipients and potential matches (non-recipients with similar characteristics). This implies that the sample has a strong focus on potential applicants, for example, in terms of farm size and orientation towards commercialisation.

The only source of information on the total population of farms in Moldova represents the (somewhat outdated) Agricultural Census 2011. Unfortunately, Agricultural Census data do not allow stratification of farms with arable land and perennial crops separately conditional upon farm size following the AIPA criteria of farm groups. Furthermore, the number of total farms is far higher than the number of active farms. Hence, the decision was made to use the national share of active farms per size category as weights. A further correction was required in order to identify the relevant population of commercially oriented farmers. Census data makes it plausible to consider only approximately 132 thousand farms that at least partly sell their production (i.e. just 16% of officially active farms). As the derived sample of commercial farms represents the most relevant population for the survey, their distribution will be used for the sampling. Thus, Table 4 presents the distribution of farms by farm size of the total area after weighting with the share of active farms and commercial farms per each stratum (N_h). Based on the formula $n_h = (n*N_h)/N$, the optimal sample size per stratum was identified for the maximum total sample (n) of 800 holdings. Since the number of medium and large farms is relatively small, their number in the final sample had to be adjusted.

For the sampling, beneficiaries and non-beneficiaries needed to be considered. The team opted for a simple approach that started from a list of 400 randomly selected beneficiary farms identified based on the distribution in Table 4, whereby the North was to be covered by 138 farms, the Centre by 174 farms and the South by 90 farms. Given the dominance of some support measures (see Table 3), these farms should represent (primarily) beneficiaries of Measures 1.2-D, 1.2-P, 1.3, 1.7. Additional cases were added from the size group of large and medium-sized farms to allow for a meaningful analysis. While subsidy beneficiaries of the year 2018 were identified through the AIPA database, farms that did not receive support had to be added through a snowball sampling procedure. Respondents from the list of beneficiaries were asked to name one or two neighbouring non-beneficiary farms of a similar size and

production specialisation which did not benefit from any agricultural subsidy over the last five years. Because the team of enumerators reported having problems finding non-beneficiaries, it was decided that first-time recipients in the year 2020/21 will be used to increase the group of non-beneficiaries. The reasoning behind this decision was that these very recent subsidies will not have unfolded any impact that can be measured in the analyses. In the final sample, the group of non-beneficiaries was therefore identified as those who had not received subsidies before 2020/21.

Table 4 **Sample size by strata – farm size**

Region	Farm size			
	Small (< 20 ha)	Medium (20 – 500 ha)	Large (> 500 ha)	
		N_h		N
	Active farms			
National	8	3,07	82	833,006
North	2	975	35	286,450
Centre (incl. Chișinău)	3	1,23	20	360,162
South (incl. UTA Gagauzia)	1	201	27	186,394
	Commercial farms			
National	1	3,13	77	138,288
North	3	994	33	40,323
Centre (incl. Chișinău)	6	1,26	19	63,587
South (incl. UTA Gagauzia)	3	875	25	34,378
	n_h (theoretical) – active farms			n
National	7	3	0.	800
North	2	1	0.	275
Centre (incl. Chișinău)	3	1	0.	346
South (incl. UTA Gagauzia)	1	0.8	0.	179
	n_h (theoretical) – commercial			n
National	7	18	5	800
North	2	6	2	233
Centre (incl. Chișinău)	3	7	1	368
South (incl. UTA Gagauzia)	1	5	1	199

Source: 2011 Agricultural Census

Note: Differences across sums due to rounding.

A survey instrument in the form of a farm survey questionnaire was designed for the data collection. While the questionnaire was partly based on existing survey instruments, the first and most important step for the specific goals of the study was to check and discuss the intervention logic of the subsidy programme. The outcome of this check of the intervention logic is a table depicting

for each measure the needs to be tackled and the way the proposed interventions address them (European Communities, 2014). The study team consulted the two core institutions, the Moldovan Paying Agency (AIPA) and the Ministry of Agriculture, Regional Development and Environment (MARDE). This consultation resulted in a table that summarised detailed policy needs and how they are addressed on the level of sub-measures of the subsidy programme. The intervention logic procedure furthermore identified the expected outcomes of each sub-measure.

The next step was to define a set of relevant outcome indicators that can be used to reflect what the intervention is aiming at in a quantitative way. In general, detailed, reliable farm performance measures such as revenues, costs and profits require bookkeeping by farms and would imply a much more comprehensive questionnaire. Within the given limits of a relatively small survey and the heterogeneity of farms, the questionnaire covered a set of indicators following the intervention logic table - most of them in the form of self-assessments by the farm managers using rating scales. Detailed information on investment activities and subsidies was recorded through the questionnaire. It furthermore covered household demographics, household members' time-allocation, income amounts and sources, factors of production, agricultural output and sales, marketing channels used, and policy transfers received.

The final structure of the survey instrument is presented in Figure 4. The sections and questions were ordered to provide an optimised flow to the questioning of respondents. An introductory section allowed some time to connect the enumerator and the respondent. Those sections of key importance for the project were asked more initially when concentration was still high. After the trust was established, sensitive issues, such as income, were asked more to the end of the interview.

0	Introduction
1	Socio-demographic data
2	Farm types and land
3	Loans and loan subsidies
4	Investment activities and investment subsidies
5	Impact indicators
6	Advisory services
7	Collaboration
8	Production
9	Income, diversification and labour
10	Marketing and competitiveness
11	Land market
12	Farm strategies and risk-taking behaviour

Figure 4 **Structure of the smallholder survey questionnaire**

The data collection was done electronically in face-to face-interviews in the field. Enumerators were equipped with laptops for this purpose. They were furthermore trained in the use of the questionnaire and survey app. The electronic data collection via a survey app increased the data quality as invalid responses could be avoided, and some consistency checks could be made automatic. It also significantly decreased the post-survey data work compared to pen-and-paper data collection.

Before the survey started, the draft questionnaire was piloted by presenting it to around 50 farms (6% of the survey sample). The farms visited for testing were diverse in terms of characteristics and type of production. The results of the test interviews were discussed in particular with a view to whether the questions were easily understood and whether important aspects had been omitted. The testing was also used to identify the remaining issues with the survey app. After the testing, the questionnaire was amended, and a final survey app was provided. The survey was administered by 17 interviewers, facilitated by national expert Dragos Cimpoies and international experts from IAMO.

The final dataset that was used for this report included 685 farm households, thereof 390 (57%) subsidy recipients under Measure 1 and 295 (43%) non-recipients (including very recent Measure 1 recipients of the 2020/21 season for which it was assumed that no impact of the subsidy could be measured yet). The sample is distributed over the geographical regions of Moldova roughly in line with the planned sampling (Figure 5).[10]

The final sample included 480 individual (family) farmers and 205 corporate farms. The sample is biased toward larger farms (Figure 6) and depicts mostly commercialised farms with (potential) access to the subsidy programme. Therefore, it is important to emphasise that the statistical validity of the findings in the survey is limited. Furthermore, the survey covers 2020, which has to be considered a year affected by drought and lower yields and incomes. This should be taken into consideration when the findings are discussed.

[10] Out of the total number of 800 interviews, first the test interviews were excluded. Further observations had to be dropped from the sample after screening the data in a first cleaning process. The screening identified farms that for instance had ceased their farm activities at the time of the interview, indicated zero land and zero income, were identified as non-commercial semi-subsistence farms or whose activities were not in primary production of agricultural products.

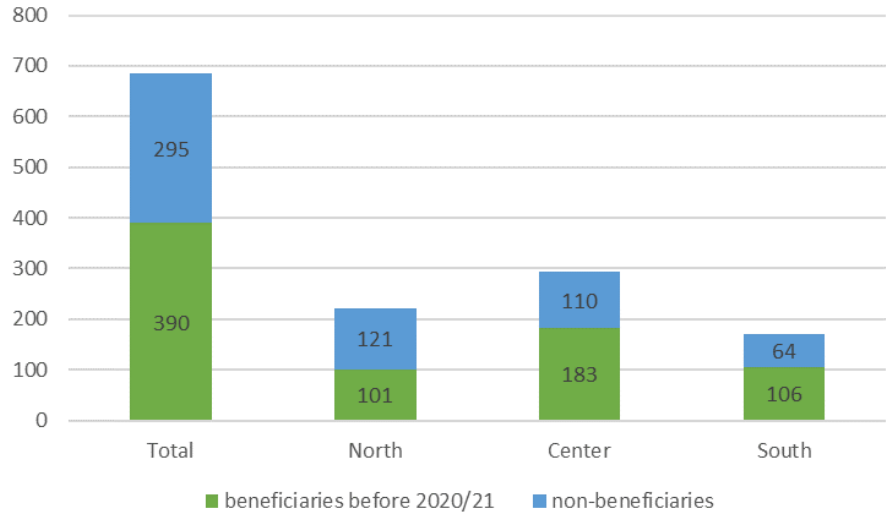

Figure 5 **Regional distribution of sampled farms (N = 685)**

Source: Own survey (2021).

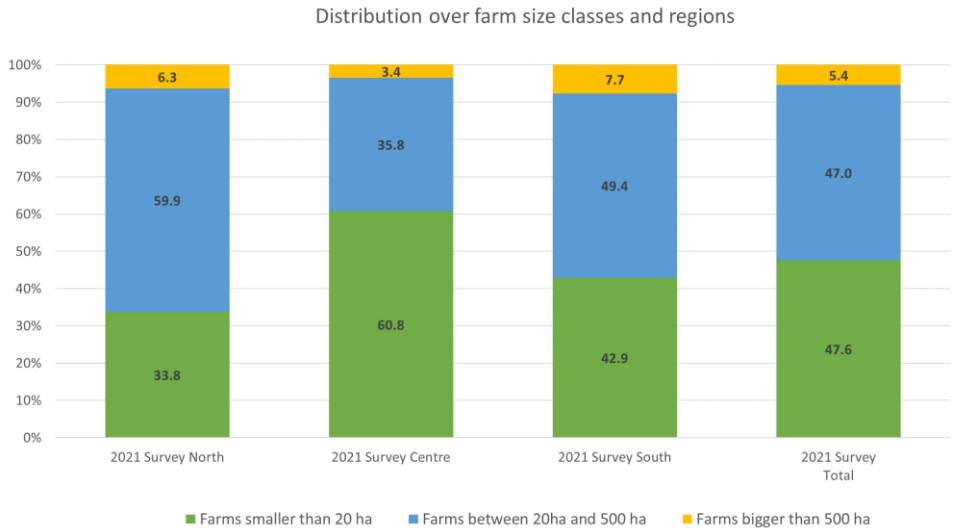

Figure 6 **Farm size classes covered by the sample**

Source: Own survey (2021).

4 A brief introduction to Moldova's farming sector and descriptive results from the 2021 farm survey

This chapter first summarises some facts about recent developments in Moldova's farming sector. It further presents core descriptive results and analyses from the farm survey conducted in 2021, focusing on farm development, farm characteristics and investments supported under the current subsidy programme.

4.1 Moldova's farm structure and farm subsidies[11]

The current fragmented farm structure in the Republic of Moldova results from the equity-driven design of the privatisation process in the early 1990s (Lerman & Cimpoies, 2006). This privatisation process provided the current and retired members of the former kolkhozes and sovkhozes with equal shares of land of different types, including a share of arable land, one of orchards, and, if available, one of vineyards. This land, the so-called "big shares", amounted to 1-2 ha for every entitled person, depending on the available land stock of the former collective farm. In addition to the big share, typically, Moldovan farm families own land around the house. The size of these "household plots" varies – depending on the village – between 0.05 and 0.5 ha. In addition, at the end of the Soviet era, most villagers received another piece of land, the so-called "small share", usually less than one hectare per household, to satisfy their consumption needs. Hence, on average, families own about three hectares of agricultural land.

Nowadays, agricultural production is provided by unregistered rural households, small and medium-sized family farms and larger corporate farms operating as legal persons. According to the latest 2011 general Agricultural Census, 900,000 farms are working on 2,243,540 ha (Table 5). More than half of them cultivated less than 0.5 ha, while about 95 % of all farms used an area of less than 3 ha. The share of land cultivated by these small farms represented just 5.5 % and 26.8 % of total agricultural land, respectively. On the other hand, around 3,000 farms with more than 50 ha cultivated over 60 % of agricultural land. These large farms cultivate land which they bought from the beneficiaries of the privatisation or, more often, is acquired through renting. They may be family farms (555 farms without juridical status; 7.2 % of land cultivated by big farms), but usually, they are registered as limited liability companies (1,261 out of 3,029, 50.5% of land) or another type of enterprise (896, 26.3 % of land). Cooperatives (184, 11.0 % of land) and state enterprises (46, 1.3 % of land) are instead a marginal phenomenon (National Bureau of Statistics of the Republic of Moldova, 2013). Zvyagintsev et

[11] This chapter summarises findings presented in a report by Zvyagintsev et al. (2021).

al. (2021) analysed different statistical sources and revealed that in recent years land used by private farms, without further separation by size, increased from 853.1 thousand (2013) to 909.5 thousand ha (2021). While the amount of land used by peasant farms declined slightly, the share of land used by households increased.[12]

Table 5 **Agricultural holdings by size classes (total land, ha), 2011**

	Area		Agricultural holdings	
	ha	%	number	%
TOTAL	2,243,540.02	100.00	902,214	100.00
0-<0,5 ha	122,287.12	5.45	459,909	50.98
0.5-<1 ha	123,326.86	5.50	180,529	20.01
1-<3 ha	355,773,94	15.86	203,644	22.57
3-<10 ha	224,951.66	10.03	52,023	5.77
10-<50 ha	63,434.04	2.83	3,080	0.34
50-<100 ha	44,425.41	1.98	617	0.07
100-<200 ha	89,859.58	4.01	621	0.07
200-<500 ha	314,416.18	14.01	963	0.11
500-<1000 ha	378,418.83	16.87	550	0.06
1000-<2500 ha	338,692.99	15.10	229	0.03
≥2500 ha	187,953.41	8.38	49	0.01

Source: National Bureau of Statistics of the Republic of Moldova (2013)

[12] From an organisational perspective, the National Bureau of Statistics distinguishes three major categories of agricultural producers: agricultural enterprises, peasant farms, and rural households (FAO, 2020). While all agricultural enterprises are legally registered entities, the category of peasant farms consists of legally registered family farms as well as non-registered individual farms. All peasant farms are classified as natural persons. The term rural household comprises agricultural operations on garden plots near houses and mainly oriented to subsistence purposes. Often peasant farms and household plots are mentioned in one category.

This partitioned farm structure of corporate farms, private farms and rural households is also reflected in the production structure. Overall, production in Moldova is concentrated on crops that contribute roughly 70 % to GVA in agriculture. Much of the livestock production is concentrated in rural households. Its share in GVA fluctuates between 30 % and 25 % (Zvyagintsev et al., 2021). Over the last decades, there has been a declining trend for particularly beef and veal, pork and poultry meat.

Productivity does not indicate a unanimous gap between organisational types of farms. While for some products, households show lower productivity (e.g. milk, fruit and berry, potatoes), the difference is relatively small for a range of other products (e.g. grapes, cereals). Average milk production per cow seems to be substantially higher in agricultural enterprises (5425 kg/ cow compared to 3524 kg/ cow in households). Similarly, the average yield of fruit and berries is more than double in enterprises compared to households (8.3 tons/ha versus 3.6 tons/ha). For grapes, the difference is smaller: 7.0 tons/ha in enterprises versus 6.2 tons/ha in households. The average yield is relatively close for cereals and leguminous crops: 3.9 tons/ha (enterprises) compared to 3.6 tons/ha (households).

Large-scale agricultural companies rely on employed labour and typically specialise in producing commodities, such as cereals and sunflower. Cereals and industrial crops, mainly maize, sunflower and (in the North of the country) sugar beet, dominate agricultural companies' production. This specialisation has been driven by several factors such as relatively low production costs, the availability of agricultural machinery, relatively cheap and straightforward post-harvest processes, and secure markets for these commodities. However, the lack of appropriate rotation schemes and irrigation has led to depleted soils and lower yields. On the other hand, small farms are more diversified and typically divide their land into three major production activities: (1) short-term rotating crops, like vegetables, including potatoes; (2) annual crops, like cereals – mostly maize – and sunflower; and (3) vineyards (Moroz et al., 2015).

Large corporate farms usually rely on lease agreements of various types with individual landowners. A functioning land market is gradually developing in Moldova. The yearly number of transactions grew from zero in 1999 to more than 70,000 in 2008. However, most of around 400,000 transactions took place in the central districts. Also, the price of land varies considerably within the country and even within districts. Considering the amount of land involved, the situation appears much more static: only around 38,000 ha (1.7 % of total agricultural land) changed owners in the first decade. The average transaction involved barely 0.10 ha (Cimpoies, 2010). The share of agricultural land under private ownership constituted about 74 % in 2013, while the remaining 26% was in public ownership (half of it pastures). At the beginning of 2020, this share was still at 74.2 % (National Bureau of Statistics of the Republic of Moldova, 2020). Disaggregating further by types of agricultural land reveals drastic differences in ownership status. Most strikingly, only 2 % of pastures and hayfields are in private

ownership. They usually belong to the municipality. To graze them, people have to pay a modest annual tax proportional to the number of owned animals (cows, goats, sheep and horses). On the other hand, 94% of vineyards are owned by farm households, whereas about 85 % of the arable land is private (National Bureau of Statistics of the Republic of Moldova, 2020).

Some observers see land consolidation as an urgent problem due to the high fragmentation of parcels (e.g. Cimpoies, 2011). Nine projects were implemented in the first decade of the 2000s to achieve this objective, mainly in the South. However, a large majority of farmers were not willing to exchange their land plots, and in many localities, there was a lack of buyers. Indeed, several studies show that land sales represent only one-third of land market transactions, leasing being the most diffused form of land consolidation. In 2020, 42.1 % of the total agricultural land was leased, 78.3 % by limited companies, 5.7 % by production cooperatives, 13.4 % by peasant farms and 2.6 % by joint-stock companies(National Bureau of Statistics of the Republic of Moldova, 2020). Most of the leasing contracts have a duration of 1-3 years, limiting the possibility for the tenant to plan in the longer term (Cimpoies, 2011).

Despite a modest increase in agricultural lending in recent years, farms remain poorly financed. The major deficiencies have been summarised as follows (Moroz et al., 2015): (1) insufficient collateral options (since banks demand an excess of collateral requirements and undervalue given items); (2) almost no supply of long-term loans, which are needed for investing in perennial crops or machines and buildings; (3) hardly any support instruments to facilitate access to credits, like loan guarantee funds. Although 58.35% of beneficiaries of guarantees from the Loan Guarantee Fund for SMEs managed by ODIMM (Organization for the Development of the Small and Medium Enterprises Sector) were SMEs dealing with agricultural activities (ODIMM, 2020) in 2020, there are still significant gaps in accessing credits. Interest rates are generally high, amounting to 8-12% annually, while annual inflation was below 5% during the last years. Anecdotal evidence points to higher interest rates faced by small farmers amounting to up to 20% for informal credit, as formal loans via banks are usually not accessible due to a lack of bookkeeping. Bigger farmers who can fulfil formal credit markets' requirements face interest rates of roughly 8%. Moreover, for the small farmers, who have no bank accounts, all loans are delivered and returned in cash (Piras & Botnarenco, 2015). Hence, the majority of small farmers rely on internal sources of funding or do not invest at all.

4.2 Descriptive results of the 2021 farm survey

In the following, results from the study's 2021 farm survey are presented. Differences between family and corporate farms and farm types and sizes are important angles for discussing the results.

4.2.1 Characteristics of sampled farms and farm managers

The results presented in this report refer to 685 surveyed family and corporate farms. Family farms dominated the sample with a share of 70%. As is the case all over Moldova, the majority of farms were specialised in crops (88%), and only a few specialised in livestock (7%) or indicated a mixed production portfolio (3%) (Figure 7). There were no striking differences between family and corporate farms (Table 6). Certainly, the above-described sampling posed a threshold issue for typical small-scale mixed farming businesses.

The utilised agricultural area (UAA) on which the surveyed farms operate covered around 85,000 ha of land. In line with the specialisation described above, the major share of this land is used for cereals (57%) and oilseeds (30%). Fruits and vineyards occupy another 7% of the UAA. All other usage takes place in comparatively small areas (. 7).

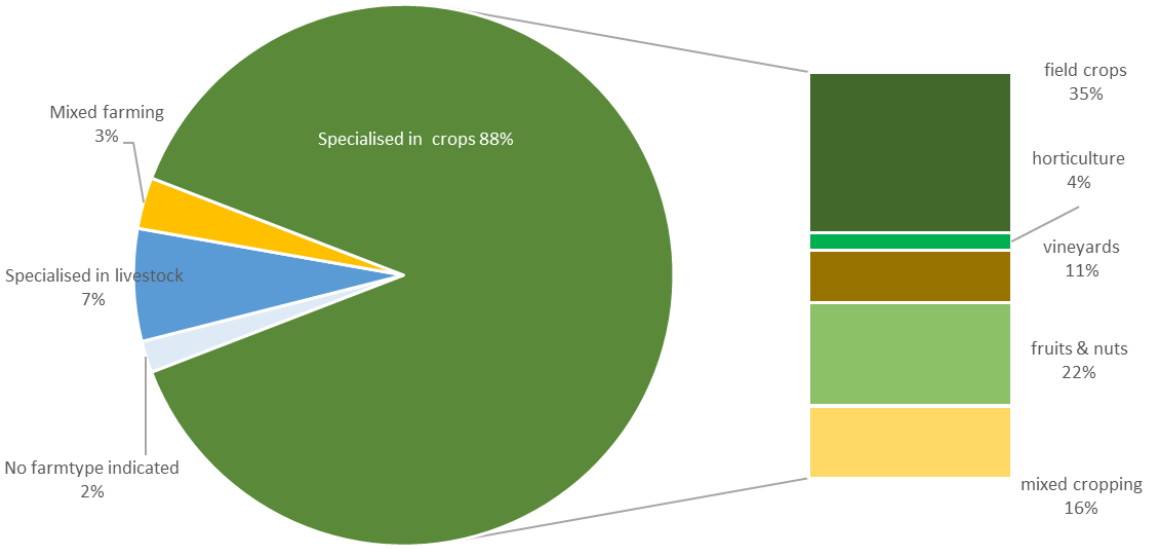

Figure 7 **Farm types (self-evaluation)**

Source: Own survey (2021).

The farm managers were, on average, in their forties and thus relatively young. The median age of family farmers was, with 43 years, younger than that of corporate farm managers (47 years). Less than one-quarter of the farm managers were female, whereby the share was slightly higher in family farms (24%) compared to corporate farms (20.5%). Typically, farm managers had an educational degree higher than a simple high school degree, but an MSc level or higher was with 6% also an exception (Figure 8). Compared to national data, where 77% have no education beyond high school, the surveyed farm managers mostly belong to the top-25% in terms of education (National Bureau of Statistics of the Republic of Moldova,

2020). Family and corporate farms differed in so far as corporate farms tended to have managers with higher education. They had, for example, more managers with MSc or higher degrees (10% versus 5 % on family farms) and only a small share of low educated managers with up to 9 years of primary education (4% versus 13% on family farms). In terms of professional education, most managers had none or had attended only short courses. Again, corporate farm managers were better educated: 58% had a professional education versus only 33% of family farmers. Although not the most recent data, but this education gap is also mirrored by data from the Agricultural Census 2011. While 68% of managers of holdings with a juridical status had some specialised education in agriculture or higher education, this characterisation holds for only 18% of the managers of holdings without a juridical status.

Table 6 **Farm types in family and corporate farms**

	Family farms		Corporate farms		Total
Farm type	number	%	number	%	
Specialised in crops	426	88.75	179	87.32	605
Specialised in livestock	37	7.71	9	4.39	46
Mixed farming	15	3.13	6	2.93	21
No farmtype indicated	2	0.42	11	5.37	13
Total	480	100.00	205	100.00	685

Source: Own survey (2021).

Table 7 **Utilised agricultural area covered by the survey vs. national land use structure**

	UAA in ha	Share in total UAA in %	National land
Total	85,141	**100.00**	**100.00**
Pastures	909	**1.07**	**13.64**
Cereals	48,238	**56.66**	**36.48**
Oilseeds	25,748	**30.24**	**15.90**
Legumes	1,475	**1.73**	**3.10**
Potatoes	23	**0.03**	**0.74**
Vegetables	391	**0.46**	**1.48**
Fruits	4,361	**5.12**	**5.21**
Vineyards	1,957	**2.30**	**7.09**
Berries	69	**0.08**	**0.16**
Herbs	101	**0.12**	**-**
Other uses	1,804	**2.12**	**15.13**
Fallow land	65	**0.08**	**1.07**

Source: Own survey (2021), National Bureau of Statistics of the Republic of Moldova (2020).

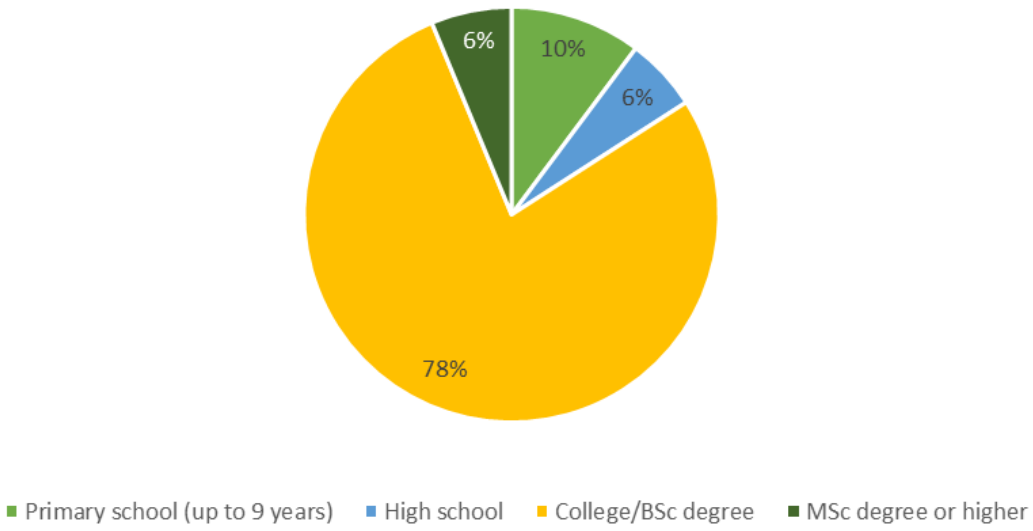

Figure 8 **Highest level of education of farm managers**

Source: Farm survey 2021

Furthermore, the survey revealed that farmers were generally self-confident in assessing their entrepreneurial personality features (Figure 9). Farmers did not only see themselves as hard workers but indicated that they liked to be their own boss or felt that their successes and failures were (partly) under their control. For all features rated in Figure 9, family farmers showed higher average values and hence an even more prominent entrepreneurial personality than corporate farm managers. Entrepreneurial success and farm management depend on taking the right risks, managing them and balancing a farm's risk exposure with increasing profits (Kahan, 2013). Risk-taking behaviour, together with other personality features and managerial skills, is therefore vital for successful farm businesses development with a view to, for instance, climate and weather risks, price fluctuations, etc. The sampled farmers showed an overall very high willingness to take risks (Figure 9 and Figure 10). Again, managers of family farms described themselves as even more risk-taking personalities than corporate farm managers. As a side note, the share of risk-takers was slightly bigger among males than women, which is in line with general findings showing that women tend to be more risk-averse than men.

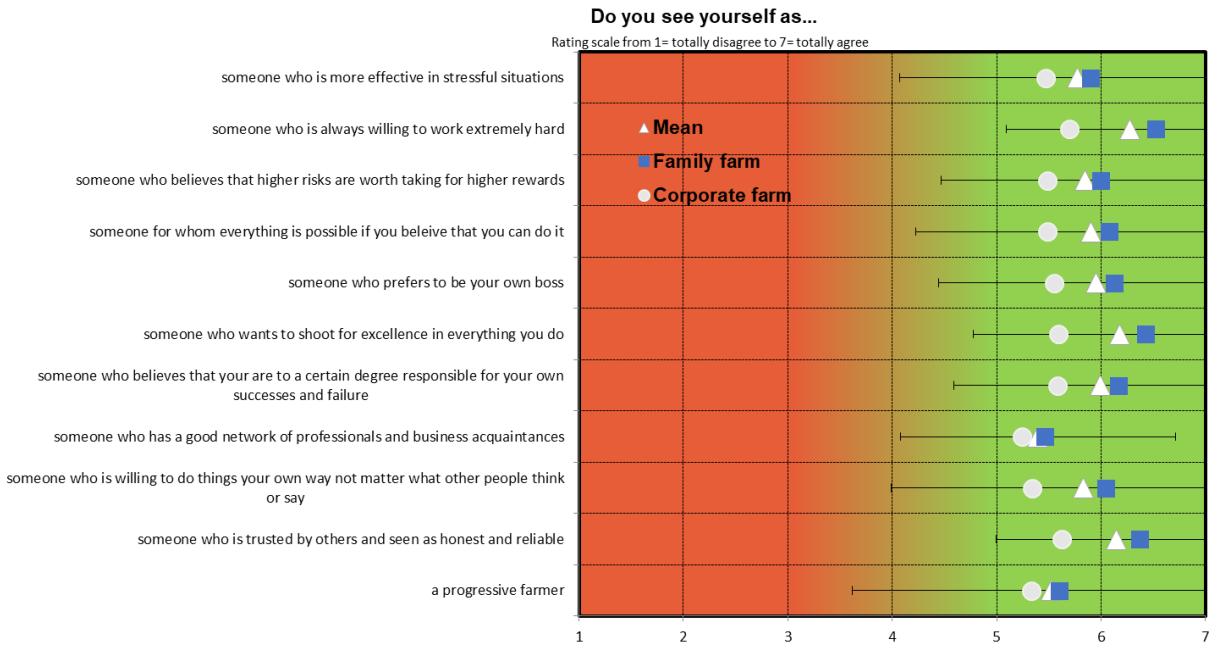

Figure 9 **Entrepreneurial personality**

Source: Farm survey 2021

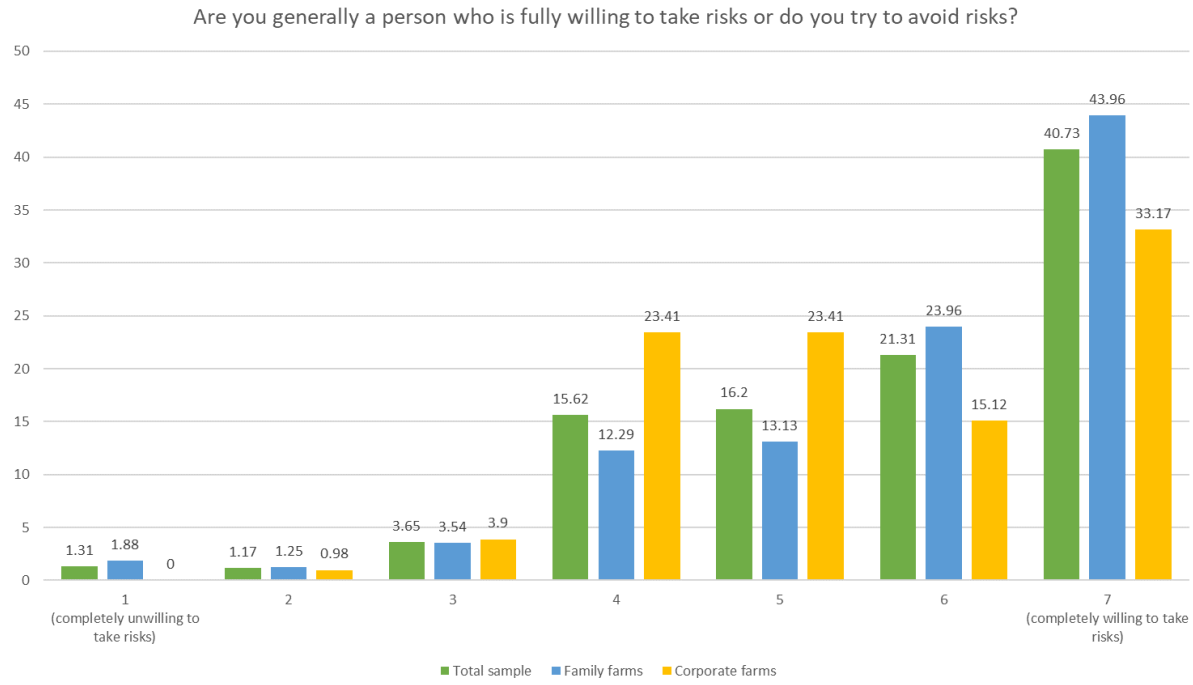

Figure 10 **Risk taking behaviour in family and corporate farms**

Source: Farm survey 2021

4.2.2 Farm sizes and land use

The sample comprises farms of different sizes, stretching from no utilised agricultural area (UAA) at all (for certain livestock specialists) to 4000 ha. The overall mean farm size was calculated as 124 ha. However, given the substantial differences, average farm sizes are indicated for three different farm size classes in Table 8: small farms under 20 ha, medium-sized farms between 20 and 400 ha, and large farms with more than 400 ha UAA. Small farms worked on less than 7 ha on average. Medium-sized farms had, on average, slightly more than 100 ha in use. Large farms worked on more than 1000 ha on average. As expected, small and medium-sized farms were primarily family farms (85% and 62%, respectively), while the large farm size class was dominated by a share of 80% of corporate farms.

Table 8 **Farm size along farm size classes**

2020 farm size class	N	%	Average farm size (UAA)	
			2020	2017
Small farms (less than 20 ha UAA)	326	47.59	6.83	6.40
Medium-sized farms (20ha to 400 ha UAA)	310	45.26	105.27	85.31
Large farms (more than 400 ha UAA)	49	7.15	1026.11	962.76
All farms	685	100	124.29	110.53

Source: Farm survey 2021

In all three farm size classes, the average farm size increased between 2017 and 2020 (Table 8). This tendency of farm growth is further explored in Table 9, which shows in more detail the growing and shrinking that has taken place in the three farm size classes. A reduction in the UAA was observed more often (in relative terms) for large farms, where more than 20% of farms shrank in size between 2017 and 2020. Small farms were the most stable group in which more than 50% indicated no changes in UAA. Medium-sized farms had the highest share of farms that had grown since 2017 (57%), followed by large farms (47%). Small farms also increased in size much more often than they decreased: less than 7% of small farms indicated a decreased UAA compared to 38% that declared an increase. This general tendency to farm growth is in line with a very low amount of land that was declared abandoned by the farms: less than 5% of the farms reported land that was permanently taken out of production, all in all 467 ha. Similarly, farms mostly used their land themselves and did not rent it out. Renting out of land was reported only for a few farms (23 farms, around 3% of the sample), and the total area that was rented out was 577 ha only, whereby one farm alone rented out

290 ha. On the contrary, renting-in land was a more widespread practice. On average, 40% of the UAA was rented (Figure 11).

Table 9 **Change in farm sizes since 2017 along farm size classes**

Change in UAA (2017-2020)	Total sample		Small farms		Medium-sized farms		Large farms	
	N	%	N	%	N	%	N	%
Farm size shrank	69	**10.07**	22	**6.75**	37	**11.94**	10	**20.41**
Farm size same	292	**42.63**	179	**54.91**	97	**31.29**	16	**32.65**
Farm size increased	324	**47.3**	125	**38.34**	176	**56.77**	23	**46.94**

Source: Farm survey 2021

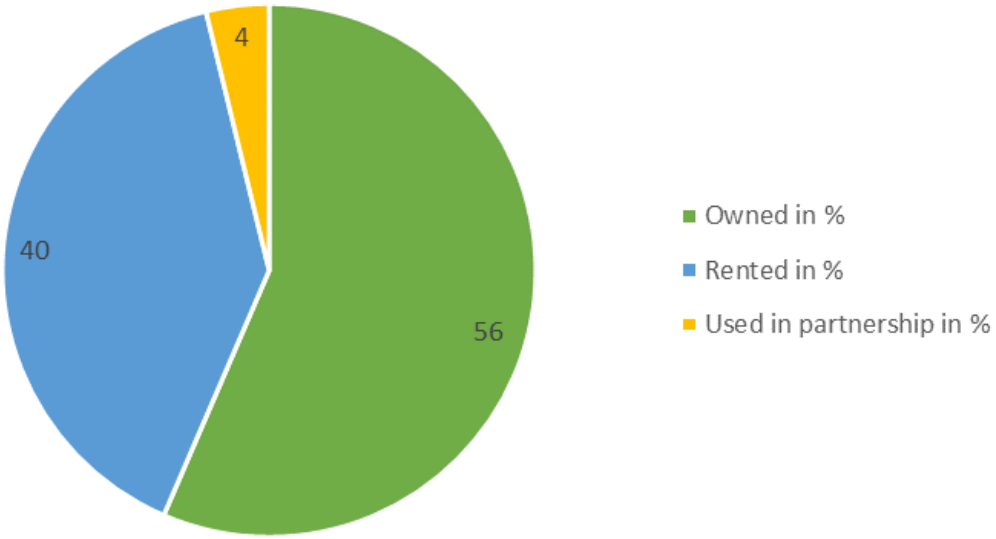

Figure 11 **Shares of owned land, rented land and land used in partnership**

Source: Farm survey 2021

The output and productivity of agricultural land can be increased through protection and irrigation. Slightly below 5% of the farms (32 farms) indicated that they had protected production in greenhouses, solariums or under rain or hail protection. Only around 200 ha of the area covered by the survey were protected, mainly through greenhouses. Irrigation was recorded

more often; it was used by 18% of the farms. The irrigated area also had a higher share in the total area (7%, 6319 ha). An increase in organic agriculture is part of the objectives of agricultural policies. Certified organic products not only have a high export market potential, but organic agriculture also contributes to environmental and sustainability goals. However, in the surveyed farms, the area under certified organic production was limited to 862 ha or 1% of the UAA. Only 14 farms (2%) had certified organic production.

4.2.3 Farm incomes, labour and employment diversification

Farm net incomes were recorded for crop production and livestock. However, the authors decided not to report average incomes or use the income in MDL in their analyses as this variable is prone to misstatements and unreliability. Due to the exceptionally bad agricultural year in 2020, more than 60% of the farms reported zero or negative total farm net incomes. Therefore, the median farm income of the sampled farms was at zero as well for both family and corporate farms. For around 250 farms that reported positive farm net incomes for 2020, the median income was 100,000 MDL. The share of farms with positive net incomes was higher for corporate farms (48%) than for family farms (32%).

Table 10 relates the 2020 income to an average of the previous three years. In particular, the differences between family farms and corporate farms are notable here. On the one hand, corporate farms reported that their past incomes were lower in 56% of the cases. This means that for a majority of corporate farms, incomes have increased. However, around one-third of corporate farms also reported decreased incomes for 2020. The majority of family farms, on the other hand, reported a decrease in incomes: 51% of the farms had a higher average income in the three years before 2020. Again, around one-third of family farms report the opposite trend of increasing incomes.

Next to their core agricultural activities, 12% of the surveyed farms indicated farm-related activities, primarily services provided to other villagers or farmers. Typical activities that make use of value-adding and short supply chains such as tourism and agricultural product processing were reported only by a handful of farms. Another source of income that may play a role in investments in family farms is remittances sent by migrants. Indeed, 50% of the family farms received remittances between 2017 and 2020. In addition, family farms often rely on diversified income portfolios in which non-farm income sources play an important role. The survey revealed that 36% of the family farms benefitted from non-farm income sources. Out of the 173 family farms with diversified incomes, 72% earned less than 80% of their income from the farm.

Table 10 **Change in net farm income over three years' time**

The net farm income in 2017-2019 (average) compared to the 2020 net farm income was:	Family farms		Corporate farms		Total	
	N	%	N	%	N	%
lower	164	**34.16**	114	**55.61**	278	**40.58**
same	70	**14.58**	24	**11.71**	94	**13.72**
higher	246	**51.25**	67	**32.68**	313	**45.69**

Source: Farm survey 2021

Table 11 offers information on the workforce employed on the surveyed farms. The total workforce varied between 1 and 270 persons. Family farms, on average, used eight people (including family and seasonal workers), while the average for corporate farms was 25. Females had a share of 38% in the total workforce. The total workforce has been broken down to a full-time equivalent (FTE)[13] of an average of 9 for all farms and 5 and 20 for family and corporate farms, respectively. Over three years, FTE was relatively stable, but both family and corporate farms recorded more increases in FTE than decreases.

Table 11 **Full time equivalent of workers employed in 2020**

	No. of workers	FTE	Compared to the average of 2017-19, FTE has		
	N		increased	stayed the same	decreased
Total sample	685	**13.06**	**9.22**	**23.36 %**	**64.67 %**	**11.97 %**
Family farms	480	**8.14**	**4.55**	**20.00 %**	**70.21 %**	**9.79 %**
Corporate farms	205	**24.65**	**20.15**	**31.22 %**	**51.71 %**	**17.07 %**

Source: Farm survey 2021

[13] The FTE corresponds to the work performed by one person who is occupied on an agricultural holding on a full-time basis. Often, a FTE is calculated as 1800 working hours per year. Each person working on agricultural activities can represent one FTU at maximum. A part-time employed person represents a fraction of a FTE.

4.2.4 Marketing and sales activities

As already discussed for incomes, 2020 was a complicated year for agricultural producers also in terms of marketing and sales. The 2020 harvests have significantly suffered from drought and hail. This might explain why farmers indicated a considerable loss or waste of production. Figure 12 shows that, on average, 24% of the production was wasted or lost, likely because of the challenges they faced in 2020. In general, the sample is focused on commercial farms. This is reflected in a 65% share of the products sold on the market, compared to only 10% consumed. These 10% likely include production provided as payment in kind for land in lease.

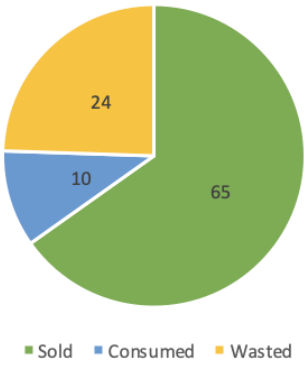

Figure 12 Sales, consumption and waste of agricultural products

Source: Farm survey 2021

Marketing activities are essential for commercial agricultural producers. In recent years, customer demands have become more stringent, and farmers have to respect more requirements to meet consumer requests (Chiriac & Suvac, 2014). Thus, farmers provided information on their perception of difficulties regarding the sales and marketing situation in the survey. Farmers rated the difficulty of the sales and marketing situation as fairly neutral (

). On the one side, 83 respondents evaluated the marketing and sales situation as not difficult at all, of which 23% were small farms, 63% were medium-sized farms, and 14% were large farms. On the other side, the marketing situation was evaluated by 118 farms as very difficult, of which 65% were small farms, 30% were medium-sized farms, and 5% were large farms. Hence, in particular, small farms face barriers in selling and marketing their products.

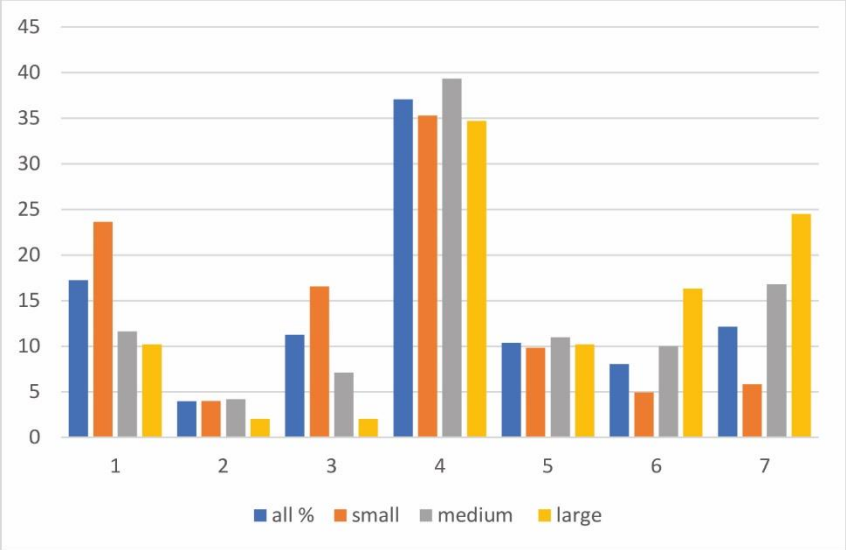

Figure 13 Difficulty of sales and marketing situation

Source: Farm survey 2021

Note: N=685, thereof 326 small farms (<20 ha), 310 medium-sized farms (20-500 ha), and 49 large farms (>500 ha). The farm managers rated the difficulty of the sales and marketing situation on a scale from 1 (very difficult) to 7 (not difficult at all).

Comparing the sales channels used in 2017 and 2020 (Figure 12), changes over the years are negligible. In both years, the most important product sales channel is through private commercial buyers. Sales directly to the international market or international customers remained unchanged and represented 5% of all sold production in both years. The share sold to the national market constitutes 15% in both years. The percentage sold through a cooperative increased by 1% in 2020, accounting for 19% of all products sold.

Nowadays, when competition in agricultural markets is fierce, farms should have clear business strategies and be able to evaluate their marketing activity, reduce costs, increase sales or enter higher-priced product markets. The marketing planning activity offers the possibility of increasing the number of customers, increasing sales and establishing monitoring mechanisms (Varner & Otto, 2008). Thus, it is sensible for many farms to spend a part of their farm budget on marketing. However, most of the managers (79%) indicated that they did not spend any budget on marketing. In contrast, only a tiny share of around 2% regularly spent part of their budget on marketing activities (Table 12). One hundred twenty-seven farms (19%) indicated spending money on marketing activities occasionally. Table 12 furthermore highlights that bigger farms tend to spend more often on marketing activities.

Spending part of the farm budget on marketing can be an essential factor in finding new clients. However, as shown in Figure 15 , farmers had a strong tendency (54%) to rely on long-

term customer relationships. Another 17% answered that they find new clients through personal contacts. Thus, trust in buyers is an important factor for marketing. Other ways of finding new customers were through an organisation/association (13%) or social media and the internet (11%).

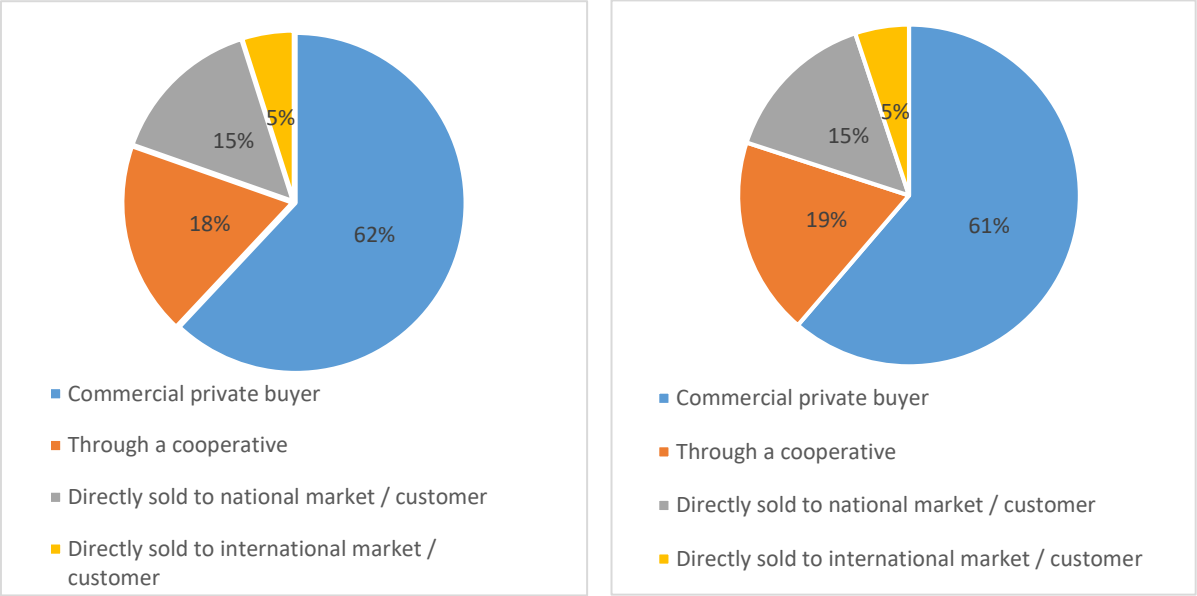

Figure 14 **Selling of products in 2017 and in 2020**
Source: Farm survey 2021

Table 12 **Spending part of farm budget on marketing**

	Total sample		Small farms		Medium-sized farms		Large farms	
	N	%	N	%	N	%	N	%
0- No	544	**79.42**	270	**82.82**	241	**77.74**	33	**67.35**
1- yes, regularly	14	**2.04**	7	**2.15**	6	**1.94**	1	**2.04**
2- yes, occasionally	127	**18.54**	49	**15.03**	63	**20.32**	15	**30.61**
	685	**100.00**	326	**100.00**	310	**100.00**	49	**100.00**

Source: Farm survey 2021

Note: N=685, thereof 326 small farms, 310 medium-sized farms and 49 large farms

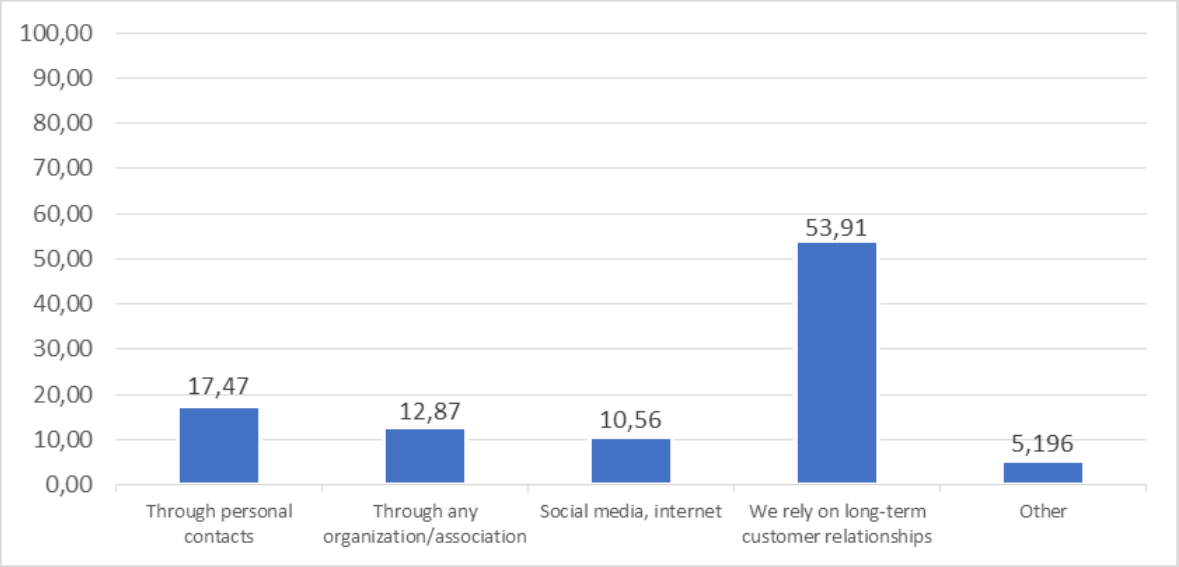

Figure 15 **Finding new clients**

Source: Farm survey 2021

Improved marketing and business success depend on overcoming existing barriers and factors that lower the competitiveness of farms. The importance of such barriers and factors were identified in the survey. Farmers were asked to rate on a scale from 1 to 7, where 1 indicates strong disagreement and 7 strong agreement, to what extent they do or do not agree with statements about possible marketing barriers (Figure 16). The differences between family farms and corporate farms are highlighted here. There are only two statements to which farmers tended to disagree, and that appear in the green area of the graph with an average rating below 4. Both of these statements refer to quality standards. First, on average, farmers do not see a problem meeting buyers' quality and quantity requirements. This is surprising, especially as quality demands become more stringent each year. Second, farmers do not lack information on the expected quality and quality standards. Respondents agreed that problematic marketing barriers exist for all the other items listed in Figure 16. The average rating span from 4.59 and 5.72. The most challenging areas as seen by farmers are access to financing, finding hired workers, price fluctuation and high prices in general. Lack of production and marketing skills are seen as barriers, but with lower ratings. Another critical barrier is seen in insufficient market and transport infrastructure. Family farms showed deeper concerns for all items in Figure 16 than corporate farms. The differences are particularly high, for example, for infrastructural barriers.

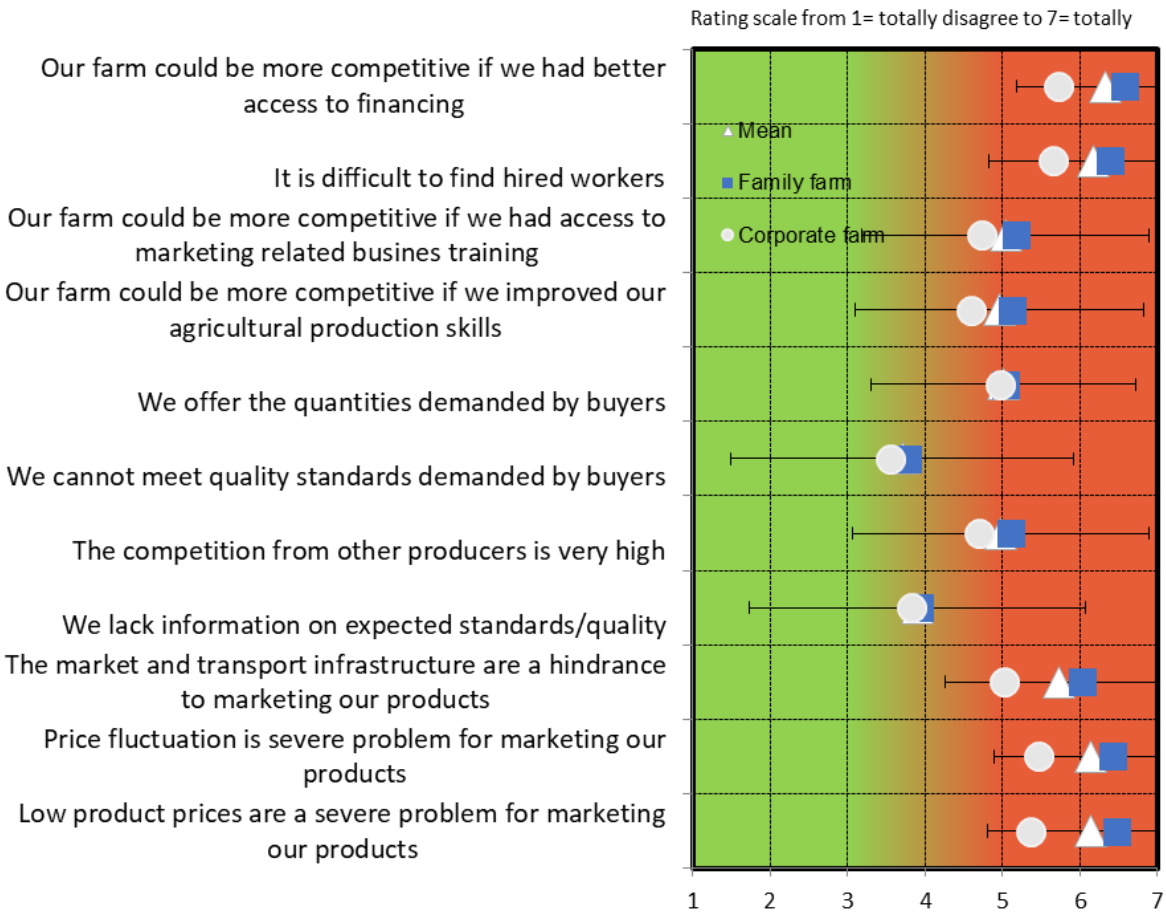

Figure 16 **Assessment of barriers to marketing and competitiveness**

Source: Farm survey 2021
Note: N=685, thereof 480 family farms and 205 corporate farms. The farm managers rated the assessment of marketing barriers on a scale from 1 (Strongly disagree) to 7 (Strongly agree).

Table 13 sheds more light on the accessibility of selected market infrastructure by looking, for instance, at the distance to the nearest points of sale or other important facilities needed for the farm. Distances were only indicated by farms for which the specific infrastructure was relevant. This table shows that the distance to the most important infrastructure points was, in most cases, quite significant. A sales point for agricultural inputs could, for example, be reached only at a distance of more than 40 km on average; the average distance to a relevant wholesale market was, on average, even almost 60 km away from the farms.

Certifications of different kinds point to the level of market integration and potential competitiveness in international markets. The survey revealed that certificates such as Global G.A.P or ISO were not widespread. Only a few farms (12 and 17, respectively) indicated to be certified with them (Figure 17). Except for phytosanitary certificates held by half of the surveyed farms, such low occurrences were recorded for all certificates, including organic certification, with only 13 cases. The main reason for deciding against certifications was that they were simply seen as not useful by 44% of non-certified farms (Figure 18). Furthermore, certification was considered too costly by around 20% or too complicated (7%). There were also almost 20% of managers who did not know about certifications.

Table 13 **Distance to critical infrastructure**

	Obs.	Mean, km	Std. dev.	Min	Max
Salespoint for agricultural inputs	582	40.88	41.38	0	250
Veterinary service	167	6.75	7.34	0	44
Milk collection site	120	16.06	14.25	0	60
Collection point for vegetable and other relevant products	180	31.59	142.21	0	1400
Slaughter facilities	122	17.40	14.38	0	60
Other processing facilities that are relevant for your production	106	16.64	28.80	0	200
Private agricultural extension service	211	23.20	21.34	0	200
Farmers market	429	22.65	20.27	0	250
Wholesale market	422	57.07	38.57	0.5	250
Closest (regional) AIPA office	607	31.56	18.06	1	130
Bank	608	18.61	11.74	0.5	80
Public transport stop	606	1.89	3.69	0	37

Source: Farm survey 2021

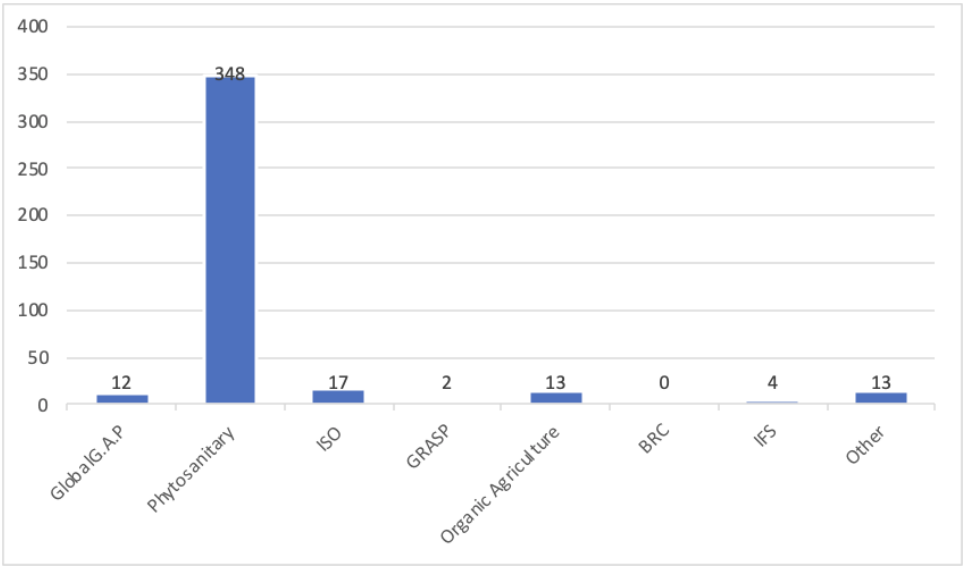

Figure 17 **Farms certification**

Source: Farm survey 2021

Note: GLOBALG.A.P- Set of Standards for Good Agricultural Practices; ISO- certificates issued by the International Organization for Standardization; GRASP- standard for GLOBALG.A.P - Risk Assessment on Social Practice; BRC- British Retail Consortium food safety standards; IFS- International Featured Standards

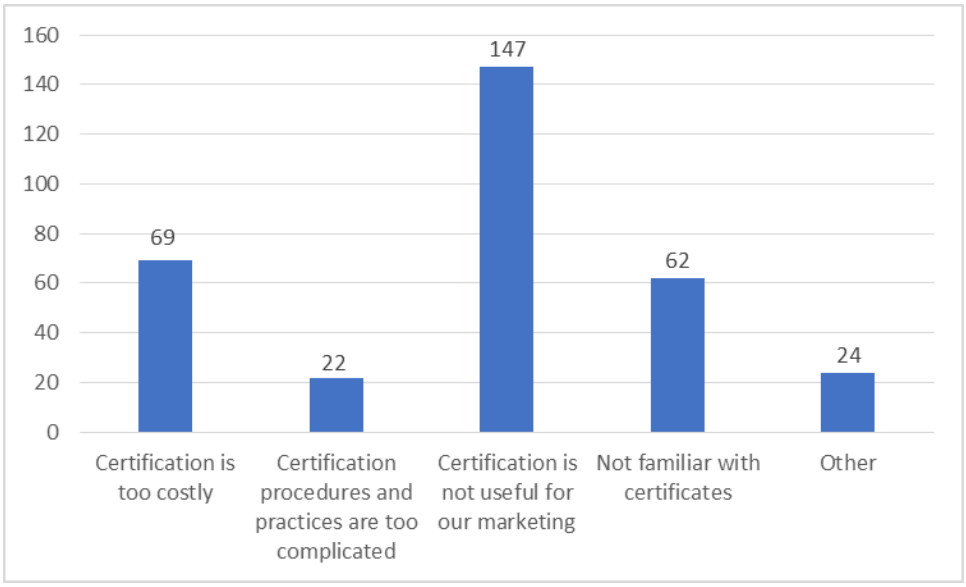

Figure 18 **Reason why not certified**

Source: Farm survey 2021

4.2.5 Access to loans for investments

Investments are the main focus of the Moldovan farm subsidy programme as they are crucial for the modernisation and development of the farming sector. Investments and modernisation largely depend on the availability of capital and financing. Even though the sample is biased toward larger, commercialised farms, 57% of the managers reported that they could not realise or had to postpone at least one investment plan[14] since 2017 due to lack of financing. At the same time, loans were accessible for many farms: more than half of the managers had applied for a loan in 2015 to 2020, almost all of them successfully. In most cases (47%), farms applied only in one year between 2015 and 2020, but there was a relatively big group of 69 applicants (20%) with applications in all six years. More than 900 loan applications were recorded in the survey, of which only 21 were not granted. As shown in Figure 19, the number of loan applicants increased from 2015 to 2020.

Most loan applications were targeted at machinery and technological equipment as well as construction material (numbers 7, 10 and 11 in Table 14). The third most significant area of loan applications was seeds and planting materials, followed by fuels and lubricants. Loans were primarily provided by banks (85%), while a smaller number of farms received loans from both bank and non-bank providers (6%) or only from non-bank providers (8%). However, the survey revealed a preference for banks and bank loans. This is visible in Figure 20, indicating a high trust in banking institutions and a striking mistrust in non-banking lenders.

The reclaim rate for loans through the subsidy programme was high at 74%. Overall, 674 loans were reclaimed by 290 farms in the years covered by the survey. The application procedure for the reclaim was assessed for the most recent loan that a farm applied for. The relatively quick processing of the applications points to a rather smooth process. More than 80% of applicants received the result of their application within five weeks, most of them within less than two weeks (Figure 21). The recorded results for these most recent loans were almost all positive, with only a handful of rejections, for example, due to lacking collateral or own financial means. The loans that were applied for ranged from 15 thousand MDL to 20 million MDL, with a median value of 400 thousand MDL. The annual interest rates for the loans were typically set around 10%: the maximum interest rate recorded was 28%. The median subsidy amount received through loan reclaims per farm for the recorded most recent loans was 54,500 MDL.

[14] Most of these failed investments were planned for machinery and technological equipment.

Table 14 **Number of loan applications by purpose of the loan**

Loan purpose	2020	2019	2018	2017	2016	2015	All years	
	Freq.	Freq.	Freq.	Freq.	Freq.	Freq.	Freq.	%
1 - seeds, planting material and support systems	27	26	24	20	11	20	128	**15.06**
2- fuel and lubricants	16	20	19	14	24	0	93	**10.94**
3 - fertilisers (mineral and organic)	12	6	9	8	10	0	45	**5.29**
4 - fodder	0	1	1	0	0	0	2	**0.24**
5 - greenhouse modules and materials for the construction/reconstruction of greenhouses, solariums and tunnels	1	1	0	1	3	0	6	**0.71**
6 - agricultural machinery and equipment, incl. for irrigation systems	10	7	1	3	0	0	21	**2.47**
7 -technological equipment, construction materials for physical infrastructure, as well as for equipment and renovation of the agricultural holding	68	59	73	54	21	0	275	**32.35**
8 - breeding animals	2	3	5	4	1	0	15	**1.76**
9 - construction and technological endowment of agritourism pensions	1		0	0	0	0	1	**0.12**
10 - technological equipment and machinery for the development of post-harvest infrastructure and primary processing in rural localities	14	9	8	3	2	0	36	**4.24**
11 - machinery and technological equipment for zootechnical farms	2	2	1	2	1	0	8	**0.94**
12 - Other	61	49	46	30	34	0	220	**25.88**
Total	**214**	**183**	**187**	**139**	**107**	**20**	850	100

Source: Farm survey 2021

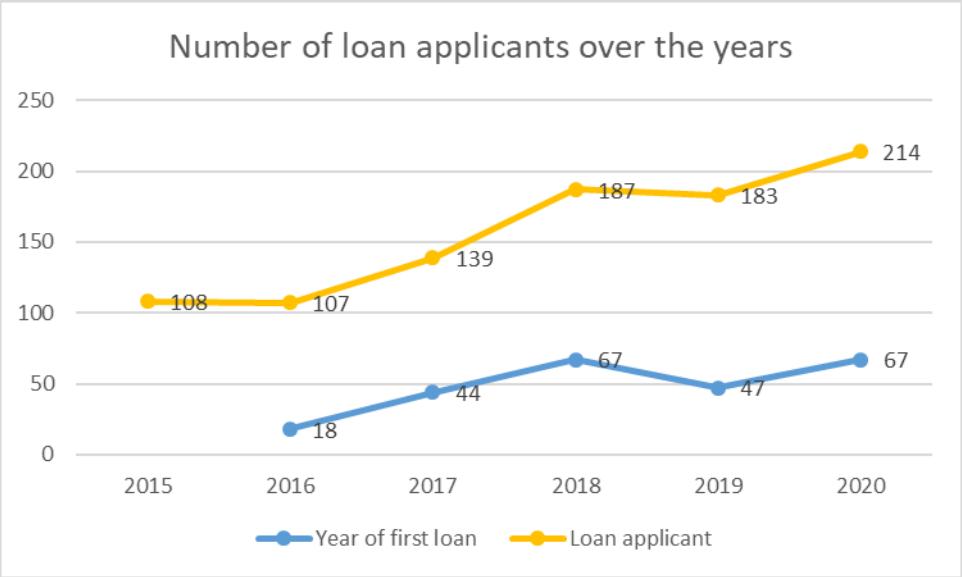

Figure 19 **Loan applications since 2015**

Source: Farm survey 2021

"*Thinking generally about banks/non-banking lenders, to what extent, if at all, do you trust them?*" Rating on a scale from 1-7, where 1 = do not trust at all and 7 = fully trust

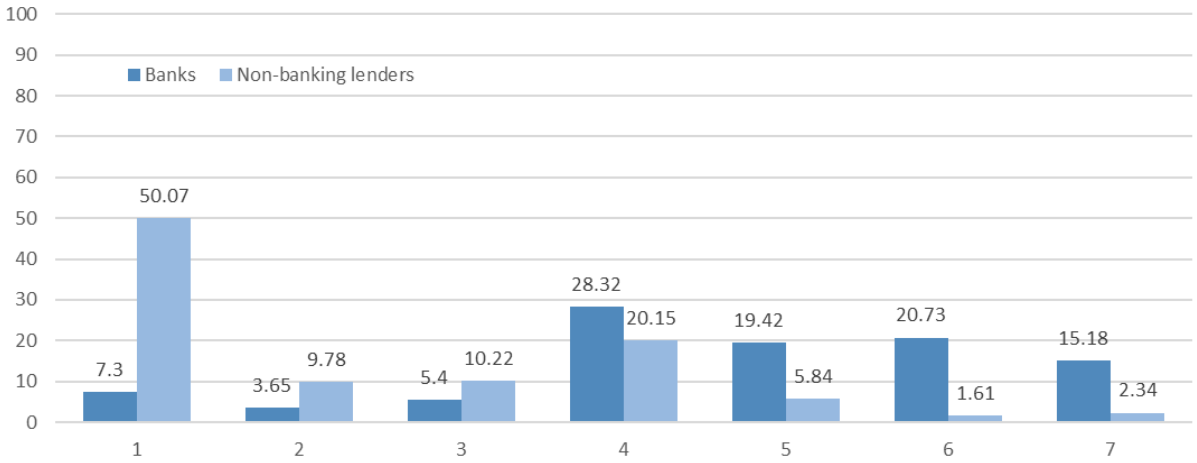

Figure 20 **Trust in banks and non-banking lenders (% of answers)**

Source: Farm survey 2021

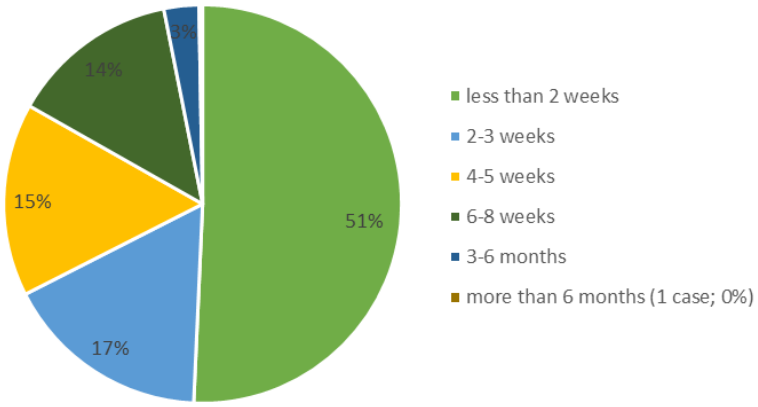

Figure 21 **Waiting time for result of credit application**

Source: Farm survey 2021

As shown in , which refers to the most recent loans for which additional information was recorded, 73% of most recently accessed loans were submitted for a reclaim through Measure 1 – almost all of them, in total 250 applications, successfully. For 27% of the loans, no reclaim application was submitted. The main reasons for not submitting a reclaim application were that the applicants thought the loan was not eligible or because they were unaware of the support measure. In addition, 18% did not apply because they considered the application too tedious and complicated. Interestingly, 46% of the subsidy recipients would have taken the credit also if there had not been the possibility of a reclaim. Yet, more than half of the recipients link their decision to take a loan with the Measure 1 subsidy.

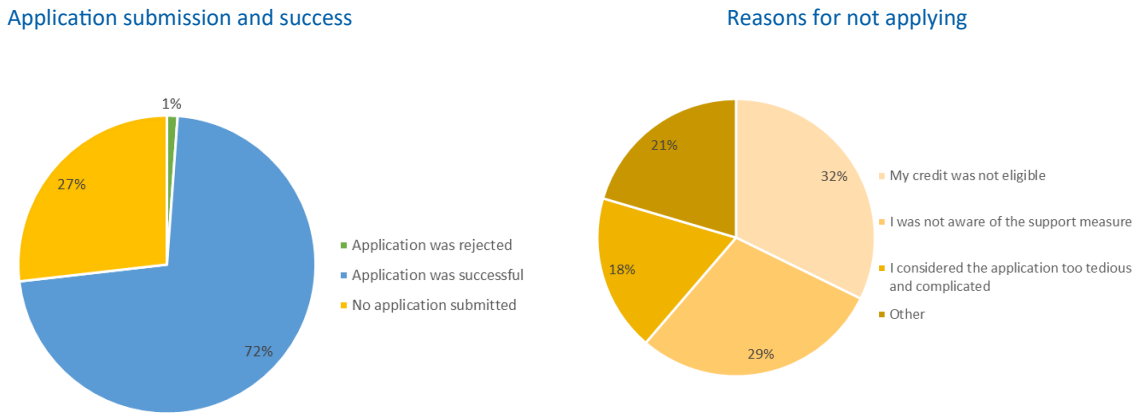

Figure 22 **Application for reclaim of loans within Measure 1**

Source: Farm survey 2021

4.2.6 Participation in investment subsidy programmes

The survey collected information on all investments in the fields covered by the current subsidy programme for the years 2015 until 2020. Overall, more than 1,700 investments were recorded for the sampled farms over the years. Investments eligible under Measure 1 were by far the most frequently mentioned investments; 86%, or 588 farms, reported investments in the fields covered by Measure 1. The majority, 524 farms, also received a Measure 1 subsidy for their investment. Measure 2 was covered by investments in 84 farms (12% of the sample), of which 60 were Measure 2 subsidy recipients. Measure 3 related investments were recorded in 140 farms (20% of the sample). Under Measure 3, 99 farms received subsidies in the sample. None of the sampled farms made investments related to Measure 4. This measure was therefore covered by a small number of qualitative interviews. Results are presented in Box **1**. Measure 5, which supports consulting and training services, was not part of the survey, but was likewise covered by qualitative interviews (Box **2**).

Table 15 summarises the coverage of investments linked to certain sub-measures and the respective number of subsidy recipients. The table underlines the uneven distribution in participation in different measures as described before. While some measures were covered by only a small number of investments and subsidy recipients – e.g. sub-measure 1.5, 1.7A and 2.5, others had several hundred participants in the sample - e.g. sub-measure 1.2, 1.3 and 1.7. Due to their general importance but low coverage in the survey, the sub-measures 1.4 and 1.5 are briefly discussed based on a small number of qualitative interviews in Box **3** and Box **4.**

Box 1 MEASURE 4. "Improvement and development of rural Infrastructure"

Measure 4 is designed to allocate funds for the (re-)construction and renovation of the infrastructure of agricultural holdings and rural agritourist boarding houses. It further supports the purchase of new machinery, equipment and facilities related to agritourism and the creation or expansion of crafting units such as wood, handicrafts, pottery, sewing, etc.

Insights were gathered from four individuals who received Measure 4 subsidies in 2018. Their businesses were in Chisinau and the districts of Hancesti, Anenii Noi and Orhei. They specialised in specific branches of agriculture such as the cultivation of lavender and its processing into essential oils, growing and storing seed and stone fruits and vegetable production. The subsidies of between 45,000 and 600,000 MDL were approved for investments into power supplies, roads to access the agricultural holding, and water supply systems to facilitate irrigation.

The application process was handled without difficulty by the applicants. None of them used a commercial service to prepare and submit grant applications. The waiting time for the result was with two to three months relatively quick, but still, some respondents complained about delays. The time until the approved amounts were received was slightly longer, with three to four months.

The respondents assessed the impact of the subsidy on their business as increasing the competitiveness by allowing subsequent investments. These subsequent investments, such as a refrigerator and modern irrigation systems, pushed productivity and business expansion. Three of the four respondents rated the farm development prospects as good, indicating the possibility of further growth. Only one respondent hesitated to give an unequivocal answer, claiming that everything depends on the loan repayment on the expected terms.

Next to the infrastructure investments that are supported under Measure 4, respondents saw a need to focus on solving issues concerning the consolidation of agricultural land, optimising the process of obtaining approvals in the design and construction of water reservoirs and irrigation systems, creating conditions for access to supermarkets for domestic producers and control of prices of inputs on the domestic market.

Box 2 MEASURE 5 "Consulting and training services"

Measure 5 provides crucial support to agricultural producers through consulting companies and specialised associations who are the beneficiaries of this measure. The support they provide spans from tailored training for agricultural producers and business plan development, including advisory assistance in submitting applications for financial support to AIPA territorial offices, to providing support in creating a dossier necessary to attract additional financial resources. The measure is thus broad and may be an essential tool to increase the size of the target groups reached through investment measures.

Insights were gathered from four individuals working in agricultural extension in Chisinau, Drochia, Hincesti and Nisporeni. Three of the four respondents accessed grants in 2020 in the amount of 56,000-162,000 MDL for the organisation of training and business plan development. They also accessed subsidies for the preparation of grant applications. The fourth interviewee accessed subsidies in 2018 amounting to 281,000 MDL for business plan development.

The respondents assessed the application process as generally not too complicated, although burdened with some bureaucracy. No clear picture was obtained as regards the processing time. Results of subsidy applications were obtained in a wide range from one to two months to over one year from the date of submission. The approved amounts were received two to eleven months after approval. According to the respondents, the implementation process suffered, among others, from unclear wording of some provisions of the regulation and the obligatory financial report.

Measure 5 financial support was used for running costs of the consulting business, such as rent payments, remuneration of employees, trainers and experts. The support was linked to an expansion of activities of the non-profit-making beneficiaries. The respondents planned further subsidy applications for the development of their activities. Fields into which they planned to expand their consulting services were the employment of young people, ecological agriculture, and business plan development.

From their consultancy point of view, the respondents suggested that policymakers increase the investment subsidies in animal husbandry projects under sub-measures 1. and 1.5, which are very expensive and difficult to finance for farmers. They further asked for more support in motivating young people to start a business, whereby they saw it, for instance, as essential to offer them no-interest loans. They also pointed to study visits and international exchange of experience as important learning platforms for farmers.

Table 15 **Overview of measures covered by the survey**

Measure/Submeasure		Number of farms with:	
Number	**Name**	**Investments related to sub-measure**	**Subsidies for sub-measure**
1	*Investments in agricultural holdings for restructuring and harmonisation to European Union standards*		
1.1	Stimulating investments for the production of vegetables and fruits on protected land (winter greenhouses, solariums, tunnels)	21	18
1.2	Stimulating investments for the establishment, modernisation and deforestation of multiannual plantations, including vineyards and fruit plantations	280	224
1.3	Stimulating investments for the procurement of conventional agricultural machinery and equipment	454	402
1.4	Stimulating investments for the equipment and technological renovation of livestock farms	29	20
1.5	Stimulating the procurement of breeding animals and maintaining their genetic background	8	4
1.7A	Stimulating the risk insurance mechanism in agriculture	2	1
1.7	Stimulating the lending of agricultural producers by commercial banks and non-banking financial institutions	349	290
2	*Investments in processing and marketing of agricultural products*		
1.6	Stimulating investments for the development of post-harvest and processing infrastructure	78	60
3	*Preparation for the implementation of actions related to the environment and rural area*		
2.1	Investments with the aim of land consolidation	10	1
2.2	Stimulating investments for the purchase of irrigation equipment	71	57
2.3	Stimulating agricultural producers to compensate irrigation costs	0	0
2.4	**Stimulating investments for the purchase of no-till and mini-till equipment**	**42**	**38**
2.5	**Supporting the promotion and development of organic agriculture**	**9**	**7**
4	***Improvement and development of rural infrastructure***	**0**	**0**

Source: Farm survey 2021

Detailed information on investments was collected only for the most recent investment under each subcategory, as shown in Table 15, for which a farm subsidy was received, or, in the case of non-recipients, simply for the most recent investment. The survey covered 1,377 such investments under Measure 1 (1,153), Measure 2 (84) and Measure 3 (140). Only around 30% of these investments were subject to a written business plan. However, this share was significantly higher under Measure 2, where about 60% invested with a business plan. This difference is explained by the higher value of investments under Measure 2 (Table 16) and the fact that business plans are required for applications for subsidies exceeding 500 thousand lei under sub-measures 1.1 and 1.4 (Measure 1) and 1.6 (Measure 2). The average investment under the Measure 1 line was 1.3 million MDL versus 3.1 million MDL for eligible investments under Measure 2. In both cases, the investment values did not follow a normal distribution, and the median of the investments was much below these average values, with 496,000 MDL and 1.2 million MDL, respectively. Amounts invested related to Measure 3 were generally lower, with an average of 767,176 MDL (median 274,209 MDL). Table 16 furthermore reports high application rates for subsidies for the investments made. The success rate of applications was 98%. Of the few rejected applications, two missed the deadline, two had errors or faults in the submitted applications, and three were considered not eligible. Some more indicated “other reasons”.

Table 16 Value of most recent investments and subsidies recorded in the survey

Type of investment	Investment cost in MDL					
	N	Mean	SD	p50	Min	Max
Measure 1	1,153	1,273,705	2,506,148	496,000	5,000	24,000,000
Measure 2	84	3,103,791	4,414,834	1,200,000	17,000	22,000,000
Measure 3	140	767,176	1,416,938	274,209	10,000	8,910,713
All (sum)	1,364	1,785,201	3,688,984	573,282	5,000	43,500,000
	Approved subsidy in MDL					
Measure 1	915	543,793	5,778,598	129,150	2,100	132,000,000
Measure 2	62	1,349,088	1,912,342	500,000	17,000	10,000,000
Measure 3	107	258,805	487,235	110,279	7,000	3,000,000
All (sum)	1,084	709,438	5,830,437	145,000	2,100	134,000,000

Source: Farm survey 2021

Note: Investments were recorded under different subcategories in line with the sub-measure of the subsidy programme. In each category, only the most recent (subsidised) investment was recorded.

For those farms that did not apply for subsidy support for their most recent investment, a variety of reasons were indicated (Figure 23). More than one-quarter of answers pointed to the ineligibility of the investment; 15% said there were unaware of the existence of the measures, and another 18% of responses stressed that an application was too tedious or complicated.

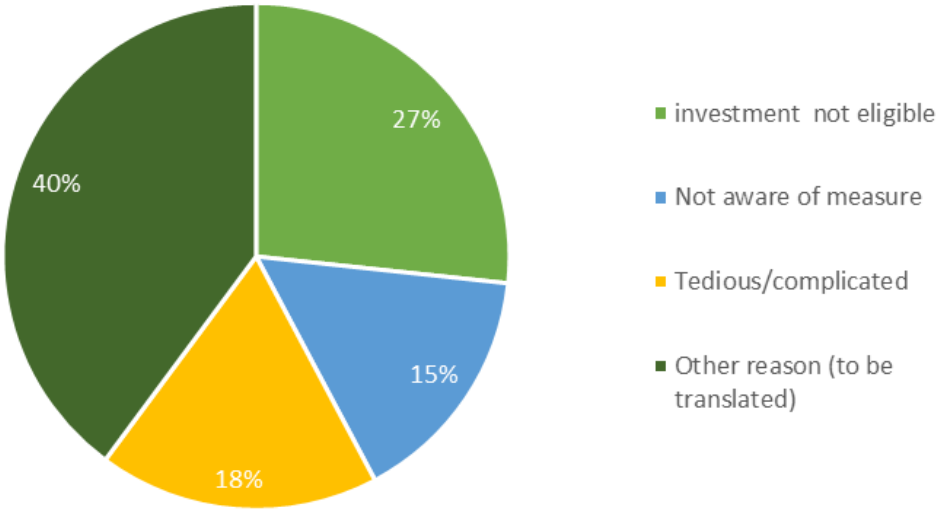

Figure 23 **Reasons for not applying for a subsidy measure**

Source: Farm survey 2021

Some of the investments implied that new jobs should be created. This was the case for one-quarter of all recorded investments. On average, 2.35 new jobs were planned. This promise of job creation of these investments mainly was realised to its potential (Figure 24).

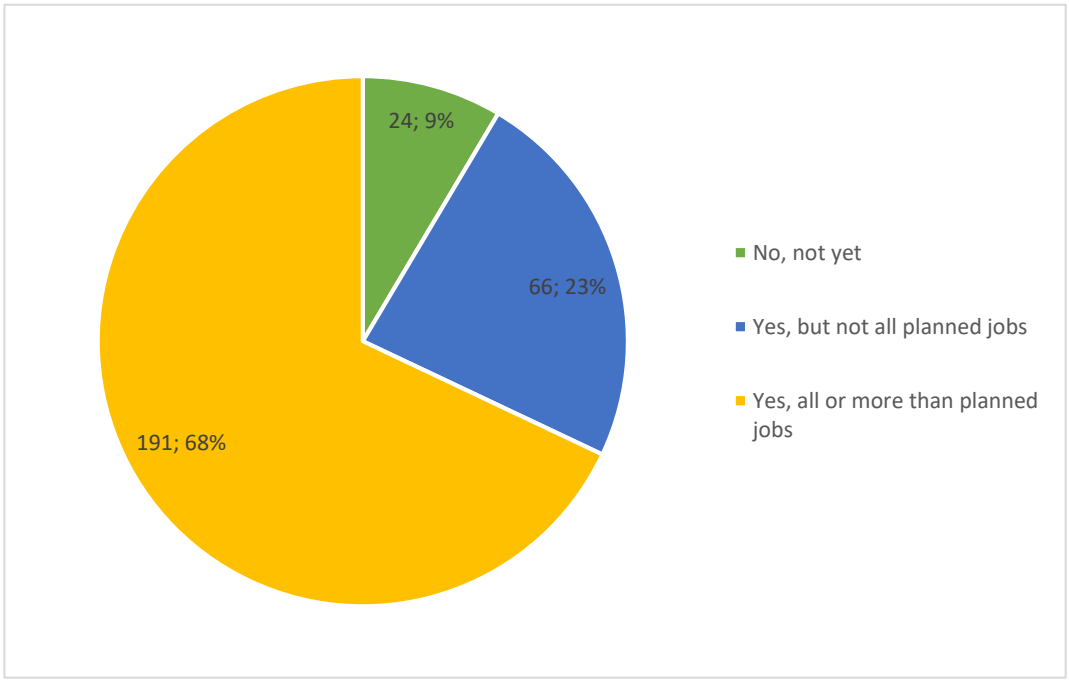

Figure 24 **Were the planned jobs linked to the investment created already?**

Source: Farm survey 2021

To encourage organic agri-food production, support small and medium-sized businesses and attract young people and women to agriculture, grants for certain groups are more favourable. Specifically, the subsidy programme targets young farmers, female farmers and return migrants by offering them 15% higher subsidies. However, the survey revealed that these groups remain a minority among the recipients. For the recorded subsidised investments, only 6% fulfilled the criterion for support for young farmers, and 5% fulfilled the standard for support for female farmers. Furthermore, support is increased by 10% under the condition of purchases of domestic production. Almost 7% were eligible for increased support under this criterion. However, only a tiny share (under 0.5%) of beneficiaries of a 20% increase in subsidies for organic producers was recorded.

Box 3 SUBMEASURE 1.4. "Stimulating investments for technological equipment and renovation of livestock farms"

The size of support under this sub-measure is calculated as compensation for the cost of new, fully paid up technological equipment designated for equipping and modernising livestock farms, including the (re-)construction of livestock farms.

Insights were gathered from five individuals who received support under sub-measure 1.4 in 2018. Their businesses specialised in breeding chicken, pigs and dairy cows. The farms were located in Anenii Noi, Basarabeasca and Soldanesti districts. The value of subsidies accessed by the interviewed managers varied between 55,000 MDL and 1.5 million MDL. Grants were accessed for the renovation and construction of stables as well as various equipment and machinery.

The application process was considered simple and easy to apply by all except one farmer, who found it difficult and complained that a lot of documents were required. None of the interviewees resorted to commercial services in preparing and submitting grant applications. The waiting time for the result did not exceed one to three months, which only one respondent considered too long. However, the approved amounts were received with some delay: more than six months after the approval of the dossier for financing. This waiting time and insecurity were seen as a hindrance to farm management.

According to the beneficiaries, the financial support positively impacted their business activities. It helped increase farm productivity, labour productivity, and allowed for expansion of the company and reduced production costs. For example, the purchasing machinery and equipment helped decrease the labour input, and rational dosing and mechanised feeding increased the milk yield. The development prospects of the subsidised businesses were generally assessed as good. The likelihood of future expansion was seen as high.

With a view to the improvement and simplification of the subsidy system, respondents indicated that they would prefer if some documents could be obtained through direct access of AIPA to databases of other state institutions. Furthermore, they proposed to provide subsidies in advance instead of ex-post. An expansion of eligible investments could include machinery needed to produce fodder, storage and insurance. Another issue in the livestock sector is the availability of farm labour: respondents asked to train and motivate young specialists, on the one hand, and incentivise unemployed people to work on the farm, on the other hand.

Box 4 SUBMEASURE 1.5. "Stimulating procurement of breeding animals and maintaining their genetic background"

Support under this sub-measure is provided for partial compensation of the investment in the procurement of breeding animals. Insights on this sub-measure were gathered from five individuals who received this type of support. Their farms, which specialised in breeding dairy cows, pigs, sheep and goats, were located in Rezina, Calarasi, Criuleni, and Taraclia districts as well as in the municipality of Chisinau. The value of subsidies to purchase breeding animals accessed by the interviewed managers varied between 100,000 and 755,000 MDL.

The interviewees, who all made the subsidy application without external support, considered the application process easy, straightforward and quick. The waiting time for the result did not exceed one to two months. Only one respondent stated that he had waited for the result for no less than three months. However, the approved amounts were received only six to twelve months after the result was approved.

The respondents indicated that their farms benefitted from the subsidies by allowing them to start or expand their business and become more competitive by improving the quality and quantity of the production. They rate their development prospects as good, despite some market challenges. All respondents plan to continue using subsidies with a high probability of further expansion.

The interviewed farmers claimed that the decision to reduce the subsidy from 70% to 50% of the amount invested was problematic for them. Another critical issue is the high fluctuation in feed and production prices. Furthermore, access to preferential bank loans would be an essential support for their business operations.

5 Policy impacts

Policy impacts are measured against a counterfactual scenario in which impacts for subsidy recipients are compared to a hypothetical control group of non-recipients. Before the impacts are discussed, the chapter first briefly converses possible effects on investment behaviour triggered by the subsidy programme.

5.1 Subsidies and investment behaviour

Suppose programme support such as investment subsidies is offered to participants who would have undertaken a similar investment without the provided support. In that case, the policy measure may produce deadweight losses, i.e. public money has been wasted without generating additional economic activity. When policy support complements own private investment, this is known as the leverage effect. Such effects should be considered in the policy assessment.

In this study, a simple self-assessment is used. It is presented in and underlines that the subsidy seemed to have played an essential role in the investment decision for most investors. Only 18% of those who applied for subsidies for their most recent investment stated that they would have made the investment also without the subsidy programme and denied the importance of the programme for their personal decision to invest. This share was higher for investors under Measure 3 (23%) but lower for investors under Measure 2 (6%). Although such self-assessment has to be assessed with caution,[15] the results seem to clearly support the assumption that the subsidy programme has significantly pushed investment activities in the priority areas set by the programme.

Interestingly, an online survey among beneficiaries only (Zvyagintsev et al., 2021) resulted in a much higher share of respondents who claimed to have invested even without subsidies (76%). This conflicting finding should not be overrated because we cannot rule out the likelihood of socially accepted response behaviour. It will be more important to see whether performance indicators of beneficiaries really demonstrate an effect of the public support.

[15] Ideally, deadweight losses, analogous to impacts on outcomes, should be analysed against a counterfactual scenario.

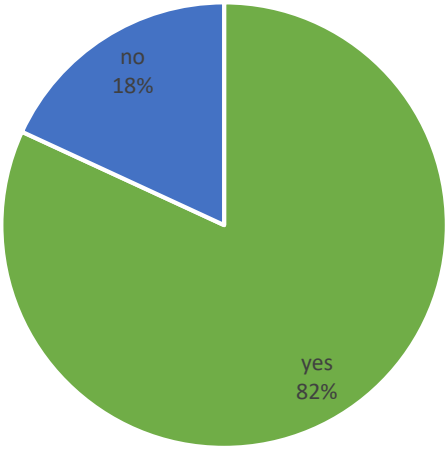

Figure 25 **Subsidy refund as relevant factor in investment consideration**

Source: Farm survey 2021

5.2 Estimated impacts of subsidies on selected outcome variables

In this sub-section, the results of a counterfactual PSM impact analysis are presented (see Section 3.1). The first step toward this analysis is estimating a probit or logit regression model that predicts the probability of receiving government subsidies ("treatment"). The PSM method requires that only those variables enter the regression that are not influenced by participation in treatment or, in other words, variables that are not outcomes of the treatment through subsidies. This precondition, together with the information on the general eligibility criteria for participation in the Moldovan government subsidy scheme, informed the choice of variables that entered the regression model used for the following analysis.

The logit model estimates the probability of receiving subsidies as a function of the following covariates: age and education of subsidy recipient; farm size; farm type (whether crop or livestock farm); rental of agricultural land, membership in farmers' association and two dummy variables for regions. Table 22 in the Appendix displays the variables entered into the model, regression coefficients for each variable, associated standard errors and p-values.

The regression results were then used to predict for each farm a propensity score, which measures the probability of becoming a subsidy recipient. To check that the overlap condition for constructing the counterfactual scenario is met, we plotted the densities of the propensity scores for treated (subsidy recipients) and control groups (non-recipients) and constructed a

histogram of the propensity scores for the two groups (see Figure 28 in the Appendix). A visual inspection of the histogram showed that propensity scores for treated and control overlapped after matching (Figure 29 in the Appendix). Furthermore, the matching quality was confirmed by comparing the standardised percentages bias before and after the matching. Once the quality of matching is assured, treatment effects can be calculated: the Average Treatment Effect for the Treated (ATET) and the Average Treatment Effect (ATE) for the entire sample.

Treatment effects refer to selected outcome indicators, which measure specific outcomes defined as objectives to be reached through a certain measure or sub-measure and identified through the intervention logic table (see Section 3.2). The selected outcome indicators analysed in the following are self-reported evaluations capturing changes across the following categories: 1) workload; 2) quality of work: 3) labour productivity; 4) workers' remuneration; 5) ability to sell; 6) farm profits; 7) environmental protection; 8) soil erosion; 9) use of fertiliser; 10) soil quality; 11) hygiene improvement; 12) quality improvement; 13) product losses and 14) production costs. Table 17 and Figure 26 depict estimated impacts of subsidies distributed under Measure 1 (Investments in agricultural holdings for restructuring and harmonisation to European Union standards) to which these outcome indicators are linked. Analytical results in Table 17 and Figure 26 focus on Measure 1 because here a sufficiently high number of beneficiaries was found compared to other measures in the farm survey. Rosenbaum's sensitivity analysis ensured the robustness of results presented here to hidden bias.

The key parameter of interest is the ATET which gives the causal interpretation of impacts in the above-outlined outcome indicators of Measure 1 interventions within the subsidy programme in Moldova. The results underline that the most potent effects of subsidies under Measure 1 were found across the following self-reported outcome categories: 1) increase in workload; 2) quality of work; 3) labour productivity; 4) ability to sell; 5) yield improvements and 6) hygiene improvements. More precisely, we found that being a subsidy recipient under Measure 1 improved the probability a farmer reported an increase in profits by 12.4%. On the other hand, subsidies increased the likelihood that a farmer reported improvements in the workload and quality of work by 10% and 12%, respectively. Subsidies led to increases in labour productivity (13%) and farmers' ability to sell agricultural produce (12.6%). Finally, subsidies amplified the probability a farmer reported yield improvements by 12.5 % and hygiene by 11.7%.

Even though effects on other categories such as the use of fertilisers and product losses were comparatively smaller and statistically insignificant, the sign of the treatment effect deserves some attention. The estimated results suggest that receiving subsidies was associated with reduced use of fertilisers and reduced product losses.

Table 17 **Average treatment effects of subsidies for Measure 1**

	Estimated effects for subsidy recipients		Estimated effects for the entire sample	
Outcome Indicators	**(ATET)**	**p-value**	**(ATE)**	**p-value**
Increase in Workload	0.105	0.016**	0.084	0.021**
Quality of Work	0.122	0.004**	0.137	0.000***
Labour Productivity	0.129	0.000***	0.156	0.000***
Worker Remuneration	0.030	0.242	0.067	0.008**
Ability to Sell	0.126	0.004**	0.117	0.005**
Farm Profits	0.124	0.045**	0.086	0.058*
Environmental Protection	0.003	0.953	0.013	0.765
Soil Erosion	-0.014	0.788	-0.022	0.628
Use of Fertilizers	-0.059	0.243	-0.052	0.247
Soil Quality	-0.031	0.486	-0.021	0.613
Yield Improvement	0.125	0.030**	0.133	0.009**
Hygiene Improvement	0.117	0.034**	0.113	0.020**
Quality Improvement	-0.015	0.783	-0.025	0.628
Product Losses	-0.048	0.364	-0.032	0.489
Production Costs	0.007	0.230	0.004	0.887

Source: Own calculations based on Farm Survey 2021 data.

Note: Treatment effects are estimated using the Stata command `teffects psmatch` with NN (3) algorithm. N=685; * Significant at 10%; ** Significant at 5%; ***Significant at 1%

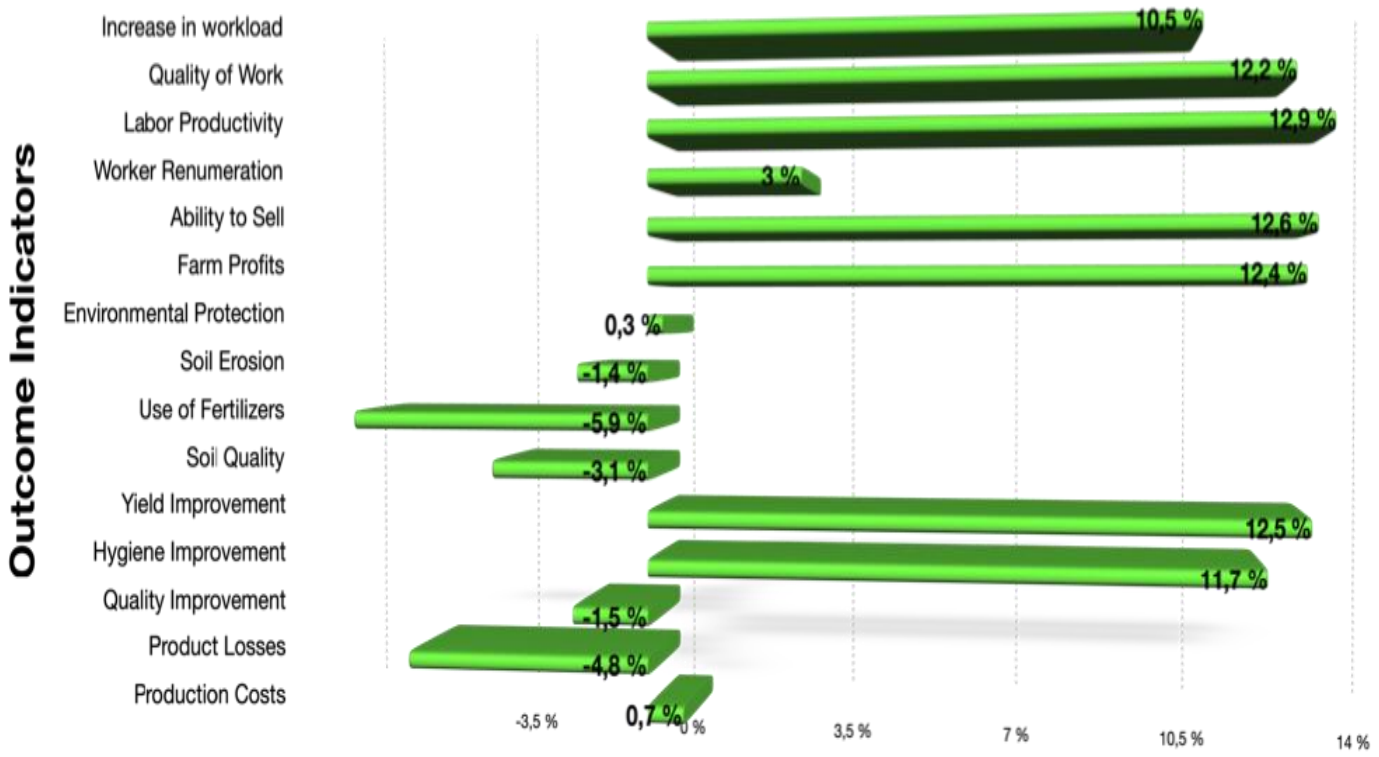

Figure 26 **Estimated impacts under Measure 1**

Source: Farm survey 2021

5.3 Treatment intensity estimations

While the previous section has given insights into whether any subsidy treatment under Measure 1 had effects on specific outcome indicators, in the next step, a closer look is taken at whether the intensity of treatment makes a difference. In our analysis, treatment intensity is defined as the number of years in which a farm received treatment (subsidies), whereby the variable depicts three intensity levels: one treatment (receiving subsidies in one year since 2015), two treatments (receiving subsidies in two years since 2015), three or more treatments (receiving subsidies in three or more years since 2015). The treatment model is a multinomial logit with inverse probability weights (ipw), which measures the effects of each intensity level on the set of outcome variables discussed in the previous section through a two-step approach. In the first step, the parameters of the treatment model were estimated, and ipws were generated. In the second step, ipws were used to calculate weighted averages of outcomes for each treatment level.

Treatment intensity estimations are presented for four key outcome variables: 1) workload, 2) yield improvement, 3) labour productivity, and 4) hygiene improvements. Table 18 shows results for the changes in workload. While roughly 61% of non-beneficiaries reported an increase in workload, results suggest that receiving subsidies once (in one year) amplified the probability of reporting an increase in the workload by 12.9%. However, receiving subsidies twice and three (or more times) increased such a probability by 12.3% and 20.6%, respectively.

Table 18 **Treatment intensity on workload**

Workload	Coefficient	Robust std. errors	z	P >z	95% conf. interval	
ATET						
1 vs 0	0.129	0.051	2.50	0.012	0.0228	0.2853
2 vs 0	0.123	0.066	1.86	0.063	-0.0064	0.2522
3 vs 0	0.206	0.056	3.66	0.000	0.0956	0.3161
0 = no treatment	0.606	0.045	13.55	0.000	0.5182	0.6936

Source: Own calculations based on Farm survey 2021 data.
Note: N=685; Treatment effects are estimated using the Stata command `teffects` with inverse probability weights (ipw).

Treatment intensity effects on yield improvement strengthened previous findings of positive impacts of subsidies, but such effects changed with the change in the frequency of subsidy receipt (Table 19). Hence, receipt of subsidies once led to an increase in the probability of

higher yields by 15.4%. However, receiving subsidies for two and three (or more times) increased such a probability by 17.9% and 25.7%, respectively. Thus, those subsidy beneficiaries who repeatedly received subsidies over the years were more likely to report gains in yields.

Another exciting result pertains to effects on labour productivity, where we found that receiving subsidies one time increased the probability of reporting productivity improvements by 4.7% (Table 20). Having received subsidies twice and thrice increased the likelihood by 6.1% and 21.5%, respectively. Yet, effects are more substantial (and statistically significant) only for the category of farmers that have received subsidies three (or more times), drawing our attention once again to the importance of receiving subsidies more frequently and over several years because only then solid and significant impacts were observed.

Table 19 **Treatment intensity on yield improvements**

Yield Improvement	Coefficient	Robust std. errors	z	P >z	95% conf. interval	
ATET						
1 vs 0	0.154	0.667	2.30	0.021	0.0228	0.2853
2 vs 0	0.179	0.072	2.47	0.013	0.0370	0.3205
3 vs 0	0.257	0.074	3.49	0.000	0.1129	0.4019
0 = no treatment	0.450	0.056	8.03	0.000	0.3401	0.5599

Source: Own calculations based on Farm survey 2021 data.
Note: N=478; treatment effects are estimated using the Stata command `teffects` with inverse probability weights (ipw).

Table 20 **Treatment intensity on labour productivity**

Labour Productivity	Coefficient	Robust std. errors	z	P >z	95% conf. interval	
ATET						
1 vs 0	.047	.049	0.96	0.337	-0.0492	0.1440
2 vs 0	.061	.070	0.87	0.383	-0.0762	0.1984
3 vs 0	.215	.048	4.41	0.000	0.1195	0.3105
0 = no treatment	.699	.043	16.34	0.000	0.6152	0.7828

Source: Own calculations based on Farm survey 2021 data.
Note: N=675; treatment effects are estimated using the Stata command `teffects` with inverse probability weights (ipw).

Last but not least, we look at the effects of the subsidy frequency on hygiene improvements in plant production (Table 21). We observed that receiving subsidies once increased the probability of reporting hygiene improvements by 8.6%, whereas receiving subsidies two and three or more times increased such a probability by 6.4% and 20.7%. Once again, more potent (statistically significant) effects on hygiene improvement were observed only for those farmers receiving subsidies three or more times.

Findings from the treatment intensity analysis demonstrated that the number of times farmers received support over the years plays an important role in the degree and strength of estimated impacts. Hence, it may not be enough to compare effects through comparisons between subsidy recipients and non-recipients in a counterfactual scenario. For certain outcome categories, the frequency of subsidy receipt may be crucial in materialising positive effects.

Table 21 **Treatment intensity on hygiene improvement**

Hygiene improvement	Coefficient	Robust std. errors	z	P >z	95% conf. interval	
ATET						
1 vs 0	0.086	0.064	1.35	0.337	-0.0390	0.2124
2 vs 0	0.064	0.071	0.90	0.383	-0.0756	0.2040
3 vs 0	0.207	0.067	3.08	0.000	0.0755	0.3395
0 = no treatment	0.559	0.056	9.98	0.000	0.4494	0.6690

Source: Own calculations based on Farm survey 2021 data.
Note: Treatment effects are estimated using the Stata command `teffects` with inverse probability weights (ipw).
Note: N=475

6 Policy implications and recommendations

This chapter provides a set of policy recommendations to improve the effects of the current subsidy programme. The recommendations are based on the results of the study. In addition, we point to limitations to more meaningful policy assessments.

Pre-requisites of meaningful policy assessment

Meaningful policy impact analyses depend to a high degree on a clearly formulated policy vision with well-defined objectives. The policy vision and objectives are the anchor point for assessing policies and policy measures. It describes what the policy wants to achieve by formulating an ambitious future scenario of how the agricultural sector should look in a defined time frame. Developing such scenarios and linking them with measurable indicators and the target figures of different indicators that a policy wants to reach is the basis for policy assessments. Hence, allocating a sufficient number of highly qualified staff to this task is a core prerequisite for setting up and continuously improving agricultural and rural policies.

Policy objectives not only need to be defined for a specific time frame but need to be in line with the scale of analysis by specifying the level of measured outcomes. For example, the competitiveness of agriculture can be measured for the sector in general (e.g. concerning the EU agricultural sector) or between different types of producers (e.g. small versus large farms). This implies that measurable indicators linked to the policy objectives are to be mirrored in farm and sector level data. Such data is an essential prerequisite for policy impact analysis and should ideally be regularly collected.

Farm-level data is needed to answer questions about the effectiveness of policy instruments at the farm level. Depending on the indicators that describe the policy objectives, such data can only be collected from book-keeping farms, which might hinder representative sampling in an environment with a large share of small farms that partly consume their agricultural production themselves and/or conduct agriculture as a side-line activity. Furthermore, any data collection is time-consuming and costly. The trade-off between a broad nationally representative dataset covering all farm types and fine-grained data which allows detailed insights into the economic situation of farms should be acknowledged. One possible strategy might consist of a more regular agricultural census or census-like data collection and a more in-depth, regularly interviewed panel of commercial farms. Again, highly qualified staff is needed to prepare and conduct surveys and the subsequent data handling and analysis. Policy assessment that goes beyond descriptive or ‘naïve’ approaches requires a team of data analysts with econometric skills within the administration.

Agricultural policy instrument choice and target groups

The Moldovan farm subsidy programme focuses on (post-)investment subsidies. While this focus aligns with the formulated objective to modernise the sector and increase its competitiveness, it has implications on the subset of farms targeted and covered by the measures. The major share of the budget spent flows to only a relatively small number of farms. These farms are most likely selected from an already more competitive segment of farms but exclude the majority of small-scale semi-subsistence farms. It is therefore recommended to consider more inclusive measures. Currently, measures with a broader effect such as farm advisory services or general improvement of (market) infrastructure could have a significantly higher out-reach but remain under-financed compared to farm investments under the current spending structure.

Farm investment subsidies may be affected by deadweight loss and leverage effects if support is offered to participants who would have undertaken a similar investment without the provided support. While the study could not analyse these effects in more detail, such effects are likely to exist for at least 18% of the beneficiaries. At the same time, there was confirmation of a positive impact of the programme in encouraging farm managers to invest and take more risky decisions. Addressing deadweight loss and leverage effects could increase the effectiveness of the subsidies. Therefore, these effects should be closely monitored.

Furthermore, as the survey highlighted, certain target groups of the subsidy programme, such as young farmers, female farmers, return migrants, or organic producers, are not well represented among beneficiaries. Promotional and information campaigns could be used to raise the attention of these target groups. Moreover, repeated applications should be possible (see also below for results on treatment intensity). At the same time, the specific needs of these groups should be investigated for better tailoring of measures. In this regard, the survey revealed that subsidy applicants – despite the high application success rates - found the application process rather time-consuming and tedious. A simplification or support during the application process may be one option to reach out to more potential beneficiaries.

Modernisation, competitiveness and improved work standards

The measures primarily used in the current Moldovan farm subsidy programme aim to modernise and increase competitiveness at the farm level and improve work standards. The analyses undertaken in this report underline that the investment subsidies had measurable effects in terms of labour, farm production and economic success. While investment subsidies were linked to increased workload, labour productivity also increased. Furthermore, beneficiaries of investment subsidies successfully increased their hygiene standards. They showed higher probabilities than non-beneficiaries to improve their business' ability to sell on the market

and increase their profits. The yields of crop production were positively affected by subsidies. Environmental effects were small and statistically insignificant, but the analyses pointed at a decrease in fertiliser use, positive effects on erosion and environmental protection in general. These effects underline that the subsidies had a positive impact in several aspects. However, these positive impacts unfold in the comparatively small group of beneficiaries, whereas it is unclear if trickle-down effects can be expected or whether the large group of non-beneficiaries will be left behind. This issue should be kept in mind in discussing future directions of the subsidy programme. Furthermore, more precise outcome indicators that measure the desired effects of a programme should be developed and regularly assessed against clearly defined target values through farm surveys.

Another significant result of the impact assessment undertaken in this study is that the intensity of treatment plays an essential role in the measured effects: subsidy beneficiaries who have received subsidies for more than one year benefit from an amplification effect. This suggests that the investment subsidies unfold a more substantial impact only after repeated treatment and in the mid or long term.

Access to loans and financing

Despite a relatively high share of more than 50% of loan-takers in the sample, access to loans and financing was identified as one relevant barrier to increasing competitiveness and farm development. Because the focus of this study is on larger and more competitive farms, access to loans should be an even more severe barrier for smaller scale, less commercialised farms that are less covered by the study but are the majority of Moldovan farms. Generally, loan subsidies as offered through Measure 1.7 are again prone to deadweight loss and leverage effects. In this case, the study pointed to a larger share of 46% of beneficiaries who benefitted from the subsidy even though they would have taken the loan also without support. Therefore, it is recommended to monitor further if the loan subsidies are re-invested into the farm business or if additional liquidity is used for consumptive purposes. It also remains an open question in how far banks and other lenders incorporate the public investment support in their credit approval decision toward farmers and farm enterprises.

Rural non-farm economy

The study focused on commercialised farms with development potential in the agricultural sector. These farms showed a tendency to invest and grow in farm size. If, however, structural change in the sector is pushed through farm investment subsidies, farms with a low development potential will be forced out of business, and alternative employment will be needed.

The survey revealed that only a small percentage of farmers engage in farm-related activities, primarily services provided to other villagers or farmers. The possibilities of value-adding and short supply chains are underused so far but could be an interesting option, especially for smaller family farms. The rural non-farm economy benefits from measures with a broader impact. The majority of current non-beneficiaries and the rural society as a whole could potentially take significant advantage of improvements in rural infrastructure (roads, public transport, rural town development, fast internet, etc.). Therefore, Moldova should give more attention to Measure 4 in the coming years. Attractive alternative employment opportunities in rural areas open up farm consolidation and growth opportunities when exiting farms offer their land for rent.

Environment and climate change

Moldovan farms may not be sufficiently prepared for climate change. So far, only a minimal share of sampled farms had protected production in greenhouses, solariums or under rain or hail protection. Irrigation was also available to less than one-fifth of farms. Regarding the goal of "greening" agriculture, agricultural policies support an increase in organic farming. However, the area under certified organic production is still very small at this stage, and further efforts are needed to change this.

Some of the measures under consideration in this study can contribute to policy goals concerning protecting the environment and climate change mitigation. Environmental effects were not the main focus of this analysis. Still, the study found that the subsidies under Measure 1 had been weakly linked to decreased fertiliser use, positive effects on erosion and environmental protection in general. Since the group of beneficiaries is comparatively small, it cannot be expected that such effects have any measurable impact on a national scale.

Limitations of the study

The study relies on a relatively small dataset, which is regionally representative, but biased toward beneficiaries and larger, commercialised farms. This also implies that it does not depict the large majority of Moldovan farms that do not benefit from farm subsidies.

Although the study applies up-to-date analytical methods, the results are limited to the scope and quality of the data. While crop farms are covered sufficiently in the dataset, other farm types such as livestock farms and mixed farms are not adequately represented, limiting the possibilities for further analysis and generalisations of the results. The same applies to subsidies for measures and sub-measures that are not well covered by the survey data.

The study was designed at a point in time when the subsidies had been in place for a longer time. The intervention logic and definition of outcome indicators were developed ex-post. The intervention logic lacks a time frame for the anticipated objectives to be reached. It also does not provide clear and measurable thresholds that would allow a more stringent assessment if a change that was observed actually satisfies the expectations or not. Furthermore, the indicators covered by the survey were primarily self-assessments because no detailed production and book-keeping data were available. Moreover, in the ideal case, the analyses should cover developments over time more precisely. This, however, would require longitudinal data.

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Appendix

Propensity Score Matching Diagnostic Tests

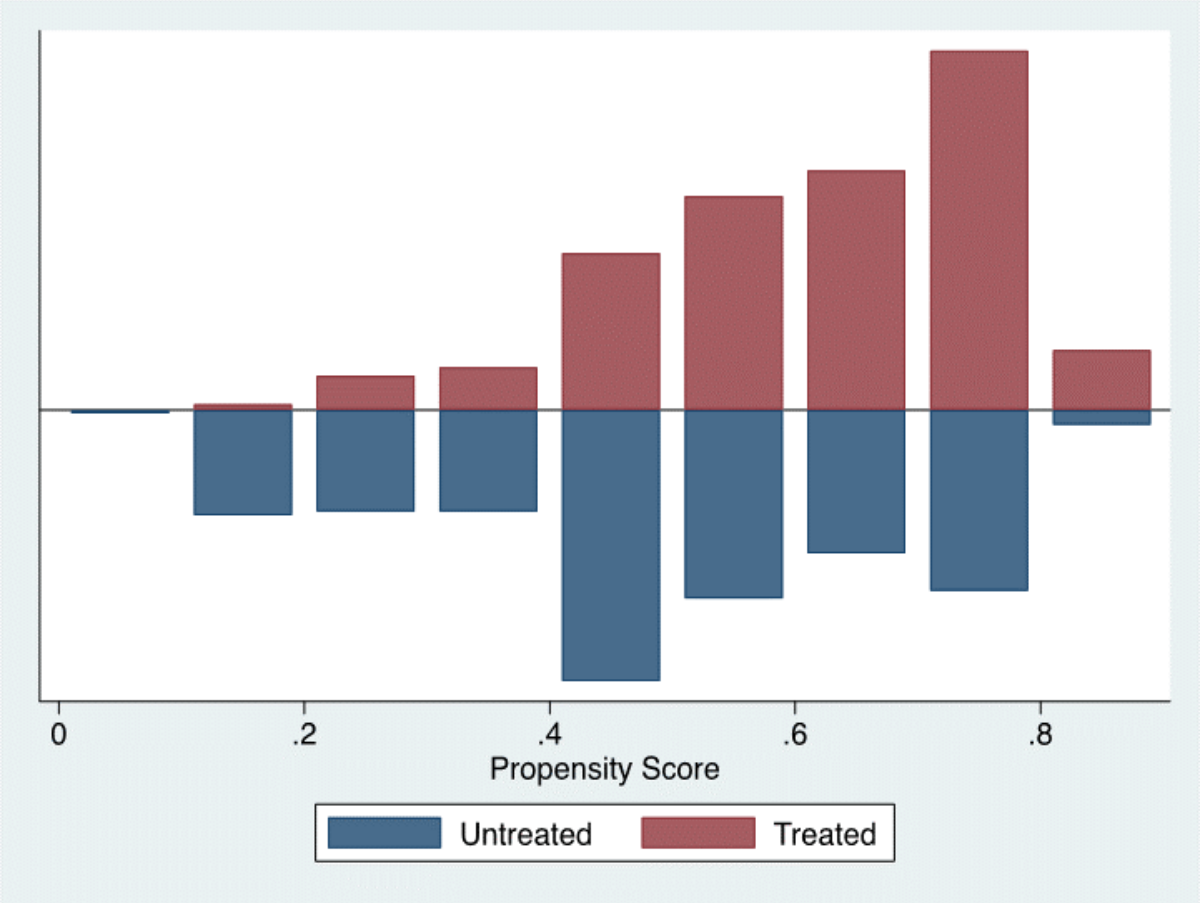

Figure 27 **Farm types (self-evaluation)**

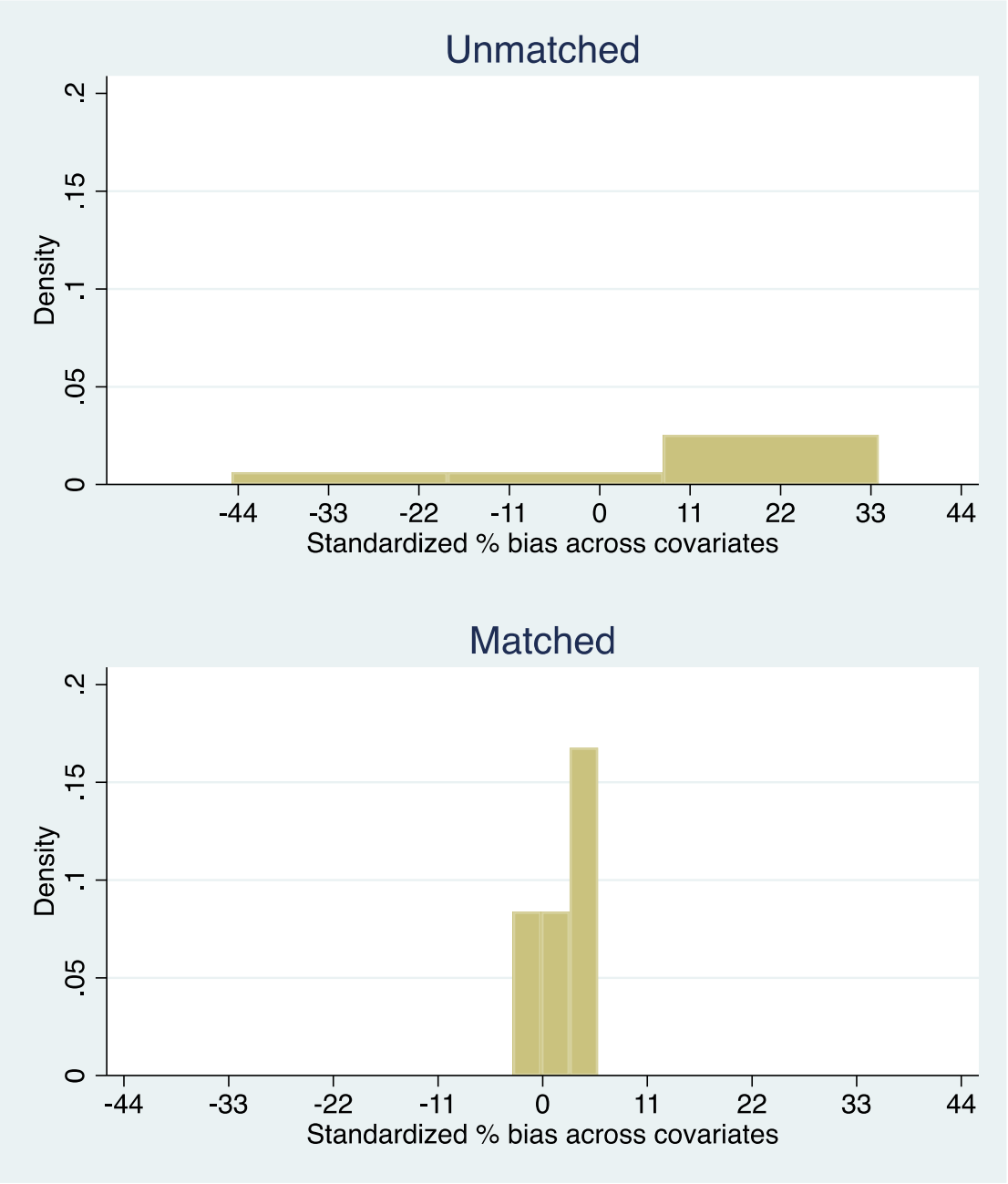

Figure 28 **Standardized percentage bias before and after matching (1)**

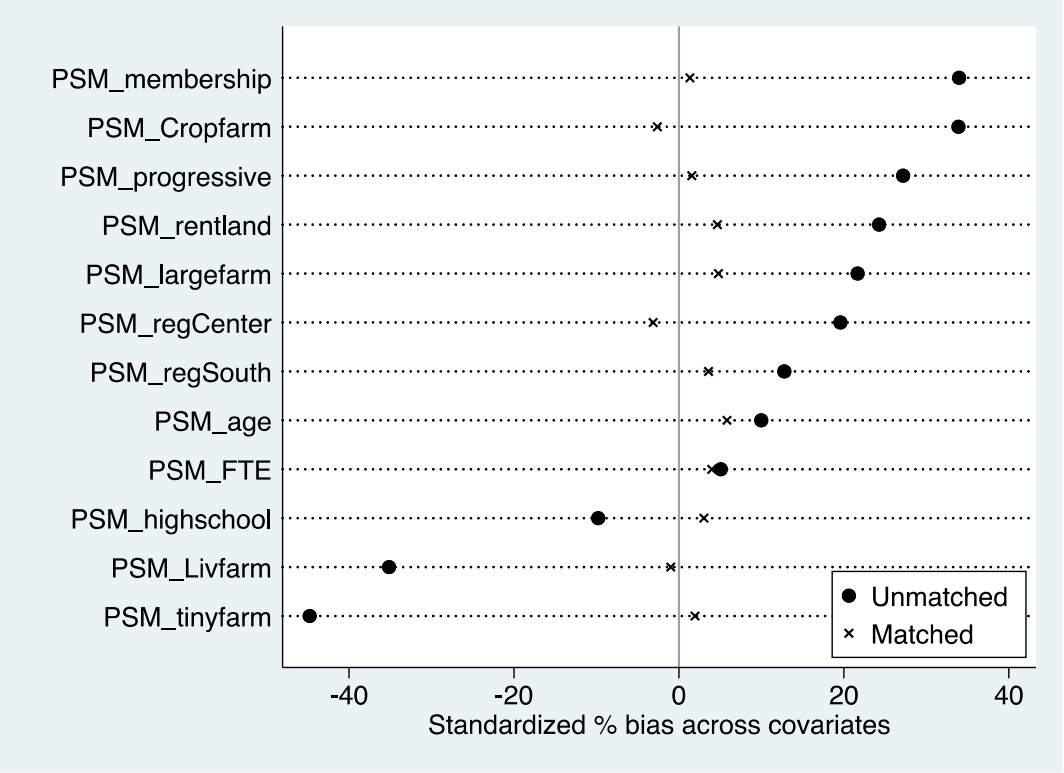

Figure 29 **Standardized percentage bias before and after matching (2)**

Table 22 PSM logit results -psmatch2

Independent variables	Coefficient	Std. Err.	z	P>|z|	95% Confidence Interval	
PSM_age	-0.0237659	.0004823	0.07	0.941	-.0123532	.0133179
PSM_highschool	0.0003533	-.0163291	-0.07	0.945	-.479446	.4467877
PSM_regSouth	-0.1555918	.8906048	3.86	0.000	.4383548	1.342.855
PSM_regCenter	0.2029941	.9044074	4.56	0.000	.5152852	129.353
PSM_tinyfarm	0.0031865	-.9259425	-3.7	0.000	-1.416.091	-.4357944
PSM_largefarm	0.0000933	.6800036	1.72	0.085	-.0949311	1.454.938
PSM_Cropfarm	1.172042	.3458107	0.92	0.358	-.3918941	1.083.516
PSM_Livfarm	-0.5572014	-.576763	-1.08	0.28	-1.622.101	.4685746
PSM_FTE	-0.4232054	-.0006547	-0.15	0.878	-.0089824	.0076731
PSM_rentland	-0.250511	.0494086	0.26	0.793	-.3190746	.4178919
PSM_membership	-1.155036	.7159147	3.21	0.001	.2789017	1.152.928
PSM_progressive	0.365328	0.170404	2.14	0.032	0.031342	0.699313
_cons	-1.26696	0.536146	-2.36	0.018	-2.31779	-0.21613

Source: Own calculations based on Farm Survey 2021 data.
Note: N=685

Table 23 **Testing the balance of covariates and absolute bias reduction**

Variable		Mean Treated	Mean Control	%bias	% reduction in bias
PSM_age	Unmatched	45.697	44.403	10	
	Matched	45.697	44.943	5.8	41.7
PSM_highschool	Unmatched	.14359	.17966	-9.8	
	Matched	.14359	.13248	3	69.2
PSM_regSouth	Unmatched	.27179	.21695	12.8	
	Matched	.27179	.25641	3.6	71.9
PSM_regCenter	Unmatched	.46923	.37288	19.6	
	Matched	.46923	.48462	-3.1	84
PSM_tinyfarm	Unmatched	.11538	.29153	-44.8	
	Matched	.11538	.10769	2	95.6
PSM_largefarm	Unmatched	.09487	.04068	21.7	
	Matched	.09487	.08291	4.8	77.9
PSM_Cropfarm	Unmatched	.93077	.82034	33.9	
	Matched	.93077	.93932	-2.6	92.3
PSM_Livfarm	Unmatched	.02821	.11864	-35.1	
	Matched	.02821	.03077	-1	97.2

Table 23 **Testing the balance of covariates and absolute bias reduction (continued)**

PSM_FTE	Unmatched	9.6907		
		8.5993	5.1	
	Matched	9.6907		
		8.8379	4	21.9
PSM_rentland	Unmatched	.59487		
		.47458	24.3	
	Matched	.59487		
		.57179	4.7	80.8
PSM_Membership	Unmatched	.87436		
		.74237	34	
	Matched	.87436		
		.86923	1.3	96.1
PSM_Progressive	Unmatched	.59231		
		.45763	27.2	
	Matched	.59231		
		.58462	1.6	94.3

Source: Own calculations based on Farm Survey 2021 data.
Note: N=685

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