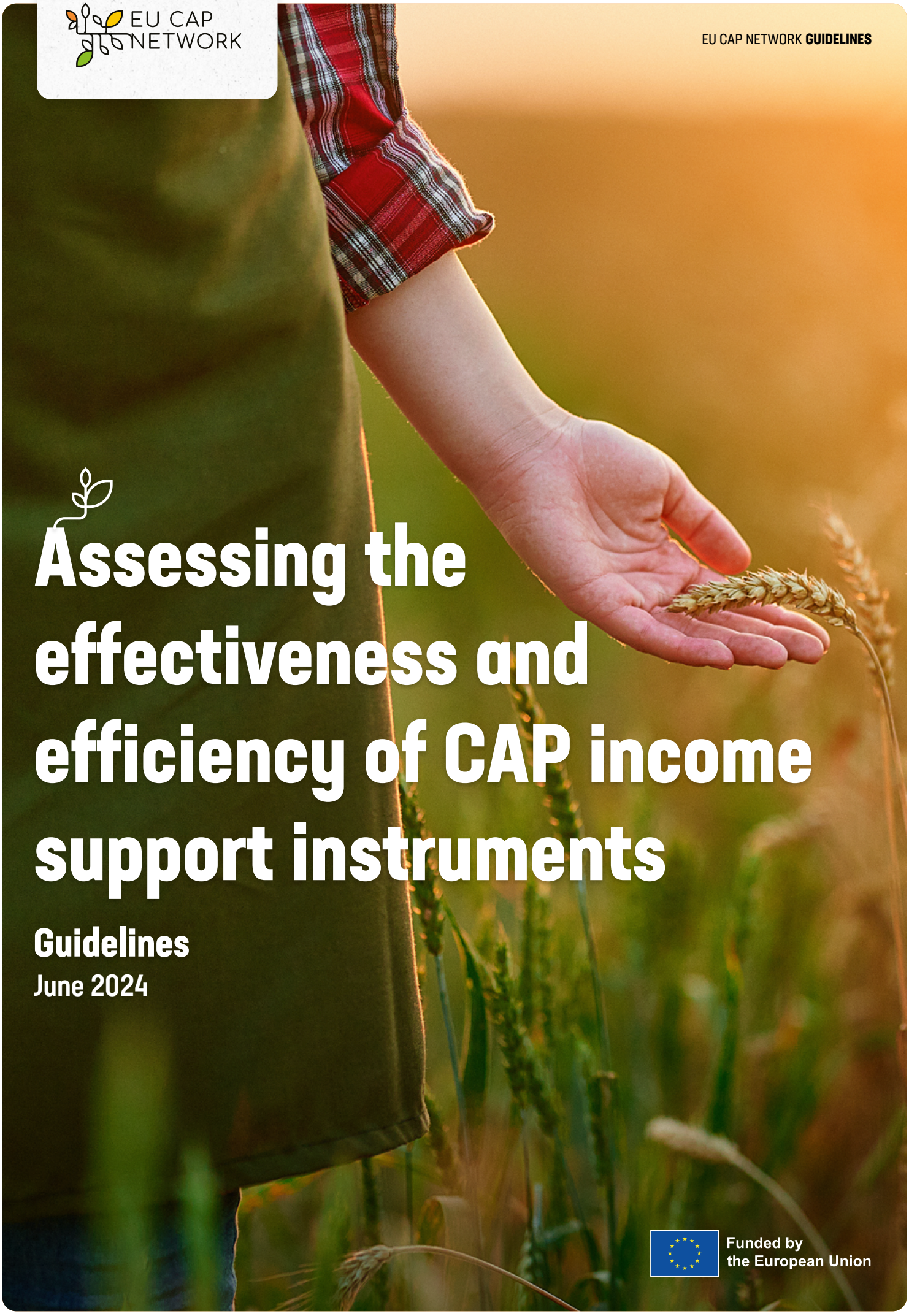

Assessing the effectiveness and efficiency of CAP income support instruments

Guidelines

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List of acronyms

ANC	Areas facing Natural or other specific Constraints
APC	Average Percentage Changes
ASD	Areas with Specific Disadvantage
ATT	Average Treatment Effect on the Treated
AWU	Annual Work Units
BISS	Basic Income Support for Sustainability
BPS	Basic Payment Scheme
CAP	Common Agricultural Policy
CATS	Clearance of Audit Trail System
CDP	Coupled Direct Payments
CIS	Coupled Income Support
CIS-YF	Complementary Income Support for Young Farmers
CRISS	Complementary Redistributive Income Support for Sustainability
CSP	CAP Strategic Plan
CV	Coefficient of Variation
DDP	Decoupled Direct Payments
DME	Data for Monitoring and Evaluation
DP	Direct Payment
EAA	Economic Accounts for Agriculture
EAFRD	European Agricultural Fund for Rural Development
Eurostat	Statistical Office of the European Union
FADN	Farm Accountancy Data Network
FNVA	Farm Net Value Added
GDP	Gross Domestic Product
IACS	Integrated Administration and Control System
IL	Intervention Logic
ISI	Income Support Interventions
ITE	Income Transfer Efficiency
MA	Managing Authority
MI	Market Income
NUTS	Nomenclature of Territorial Units for Statistics
OECD	Organisation for Economic Co-operation and Development
PMEF	Performance Monitoring and Evaluation Framework
QCTE	Quantile Continuous Treatment Effect
QDRF	Quantile Dose-Response Function
QR	Quantity – Removed Obligation at EU/national level
RDP	Rural Development Programme
REV	Amount of Revenues excluding the indirect policy support ISI
SAPS	Single Area Payment Scheme
SD	Standard Deviation
SFP	Small Farmers Payment
SO	Specific Objective

SYS-GMM	System Generalised Method of Moments
TAP	Total Annual Payments
TF	Type of Farming
TFEU	Treaty on the Functioning of the European Union
TWG	Thematic Working Group
UAA	Utilised Agricultural Area
VAT	Value Added Tax
WFD	Water Framework Directive

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Representatives from Member States commented on the draft version of the guidelines during the sounding board consultation in January 2024, which included evaluators, experts from Managing Authorities and researchers.

The Thematic Working Group was coordinated by the European CAP Network supported by the European Evaluation Helpdesk for the CAP under the guidance of Alice Devot.

Introduction

Legislative requirements for Member States to assess CAP income support interventions

Until 2023, evaluations of CAP income support interventions, including direct payments, were mostly conducted at the EU level. However, with the new delivery model established by Regulation (EU) 2021/2115 [1], these interventions are now included in the CAP Strategic Plan of Member States for 2023-2027 and evaluating their effectiveness and efficiency over the programming period is an integral component of Member States' evaluation activities.

Additional specifications are established by Article 1 of the Commission Implementing Regulation (EU) 2022/1475 [2], which requires Member States to evaluate the contribution of their CAP Strategic Plans along the effectiveness, efficiency, relevance, coherence and Union added value dimensions. Article 6 of the same regulation further indicates that this evaluation should be based on the Performance Monitoring and Evaluation Framework (PMEF), and that "Member States shall quantify the contribution of the CAP Strategic Plans to the development of at least the common impact indicators set out in Annex III to this Regulation".

The changes in the legislative framework have led to specific challenges associated with the evaluation of CAP income support interventions. Against this background, these guidelines aim to improve the capacities for evaluating the effects of CAP income support interventions on farm income and their efficiency.

Definition of effectiveness and efficiency

Effectiveness and efficiency are two evaluation criteria that can be considered when assessing a policy or programme. They both refer to the effects achieved by a policy but consider these effects from a different angle.

Effectiveness considers the extent to which an intervention achieves its objectives, including any differential outcomes across groups. For instance, if the objective of an intervention is to reduce income disparities among farms, then its effectiveness will be assessed by considering the reduction in farm income disparities over a programming period. Effectiveness can provide insight into whether an intervention has attained its planned results, the process by which this was done, which factors were decisive in this process and whether there were any unintended effects.

Efficiency compares the effects of an intervention to the (financial and administrative) resources engaged for its implementation. To identify potential efficiency gains, the analysis considers if the conversion of inputs (funds, expertise, natural resources, time, etc.) into output, results and impacts was achieved in the most cost-effective way possible, Compared to feasible alternatives. It also explores the potential for simplification and administrative/ regulatory burden reduction.

Main challenges in assessing income support interventions

Several methodological and practical challenges arise when assessing the effects of CAP income support interventions, such as:

Complexity of the farm income related economic concepts – Farm income can be appraised through different indicators (Farm Net Value Added (FNVA), Farm Net Income, with/without wages, etc.), depending on aspects to be considered in the analysis. Moreover, the numerous factors affecting farm income and the complex mechanisms require differentiated analyses by farm type, size, location, etc. Hence, the evaluation and assessment of CAP effects requires a good knowledge of the farm sector, the farmers' behaviour and the farm accounting principles.

Demonstration of the CAP net effects – As the CAP interventions come in addition to a series of on-farm strategic decisions and exogeneous factors affecting the yield or market prices, it is challenging to assess the net contribution of CAP interventions in the trends observed. Moreover, a major methodological issue is the counterfactual situation of comparing CAP direct payments delivered to the vast majority of eligible farmers. Hence, where can a counterfactual be found or how can it be built? The solution developed in these guidelines compares the current situation to a hypothetical scenario where direct payments are not made. This approach is examined in chapter 3.

Need for data – The effectiveness and efficiency analyses must rely on sound and comprehensive databases to quantify the effects and level of efficiency of CAP interventions. As farm income is affected by several factors, the analysis of their specific influence requires data collection for each of these variables (e.g. farm turnover, costs, annual work units, production, size, market prices, income support, etc.). Although databases exist at the national level in Member States, the lack of interoperability between databases can sometimes limit the analyses and require collecting additional primary data for the evaluation, which is time-consuming and costly. The type of data available (e.g. aggregated data at national level and individual data for a sample of farms) can determine or constrain the type of analysis.

Technical skills to implement quantitative methods – The impact evaluation methodology refers to a set of theoretical and empirical methods elaborated in a dedicated and rich scientific literature corpus and research field. Specific skills are required to determine appropriate approach to be implemented, according to the data available and rationale of an intervention. However, these skills are generally available in research centres/universities among experts with very narrow-focused topic expertise. Therefore, the proper assessment of CAP income interventions would require identifying such experts and building a close collaboration partnership.

[1] Regulation (EU) 2021/2115 of the European Parliament and of the Council of 2 December 2021 establishing rules on support for strategic plans to be drawn up by Member States under the common agricultural policy (CAP Strategic Plans) and financed by the European Agricultural Guarantee Fund (EAGF) and by the European Agricultural Fund for Rural Development (EAFRD) and repealing Regulations (EU) 1305/2013 and (EU) 1307/2013. http://data.europa.eu/eli/reg/2021/2115/oj

[2] Commission Implementing Regulation (EU) 2022/1475 of 6 September 2022 laying down detailed rules for implementation of Regulation (EU) 2021/2115 of the European Parliament and of the Council as regards the evaluation of the CAP Strategic Plans and the provision of information for monitoring and evaluation. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32022R1475

Purpose of the guidelines

Against the background of the above-outlined legislative requirements for Member States to assess CAP income support interventions, and the challenges associated with this exercise, the European Evaluation Helpdesk for the CAP led a Thematic Working Group to gather academic experts specialised in quantitative assessments of CAP direct payments to develop written guidelines designed for Managing Authorities and evaluators.

These guidelines intend to provide methodological guidance to assist Member States **to prepare, structure and conduct quantitative analyses in the frame of evaluations of CAP income support**. Specific material was further developed from existing guidance and outcomes of relevant activities of the Evaluation Helpdesk and complemented with ad-hoc expert work on existing challenges and methodologies **to assess the effectiveness and efficiency of the CAP income support interventions** in ensuring adequate levels, stability and distribution of farm income.

The guidelines show possible ways to conduct quantitative analyses in order to demonstrate/quantify the contribution of the CAP to the agricultural income related impact indicators listed in Annex III [3] of Commission Implementing Regulation (EU) 2022/1475. Where possible, the guidelines use practical examples to illustrate how challenges can be addressed and what alternative solutions can be implemented.

Target groups for these guidelines

The present guidelines are addressed to Managing Authorities who wish to learn more about the potential challenges in assessing the effectiveness and efficiency of CAP income support instruments and interventions, as well as potential ways to deal with these challenges. Managing Authorities may also find the guidelines helpful while ensuring the required skills and capacities to tender out the corresponding evaluations, follow up on their implementation, and critically discuss and communicate their findings.

In parallel, the guidelines aim to be a reference document for evaluators wishing to thoroughly analyse choices made by their Member State (e.g. on capping, degressivity, internal convergence, etc.) and the CAP Strategic Plan's (CSP) interventions aiming at supporting farm income. The document helps to familiarise methods that can be used for the assessment of the effectiveness and efficiency of CAP income support instruments and interventions, and the corresponding data requirements, to draft a comprehensive evaluation approach.

Scope and structure of the guidelines

This guidance document focuses on assessing the effectiveness and efficiency of CAP income support instruments. Hence, the document provides guidance on existing approaches to assess the impact of the CAP during the 2023-2027 programming period. It does not aim at assessing the impact of the reform of the CAP compared to the previous programming period, which would imply an assessment of the occurred change in policy.

The policy measures under analysis are those classified as income support instruments (ISI) and presented later in 1.2.2 These are:

1. Basic income support for sustainability (BISS)
2. Complementary redistributive income support for sustainability (CRISS)
3. Coupled income support (CIS)
4. Direct support provided to areas facing natural or other area-specific constraints (ANC) and area with specific disadvantages (ASD)
5. Complementary income support for young farmers (CIS-YF).

The focus on these interventions is motivated by the fact that other interventions, even if potentially affecting farm income, can do so only indirectly. For instance, eco-schemes require an additional counteraction by the farmers. Therefore, even if eco-schemes can have an impact on farm income depending on the level of support granted, it is not their primary objective and the assessment of their induced effects on income would require a different approach than those considered in these guidelines.

The objective is to provide guidance to assess the impact on farm income, i.e. the income generated by agricultural activities. It is important to underline that the guidance is not considering possible implication on the income of farm households that is also generated by non-farm activities. It does not consider the other effects of CAP income support instruments (e.g. on farmer's behaviour and strategic decisions, on resilience, on productivity, etc.).

The CAP impact on income is articulated in relation to level, volatility and distribution. These are three very different dimensions related to farm income, whose assessment requires different approaches. As it will be seen, even for the same dimension, different methods are available.

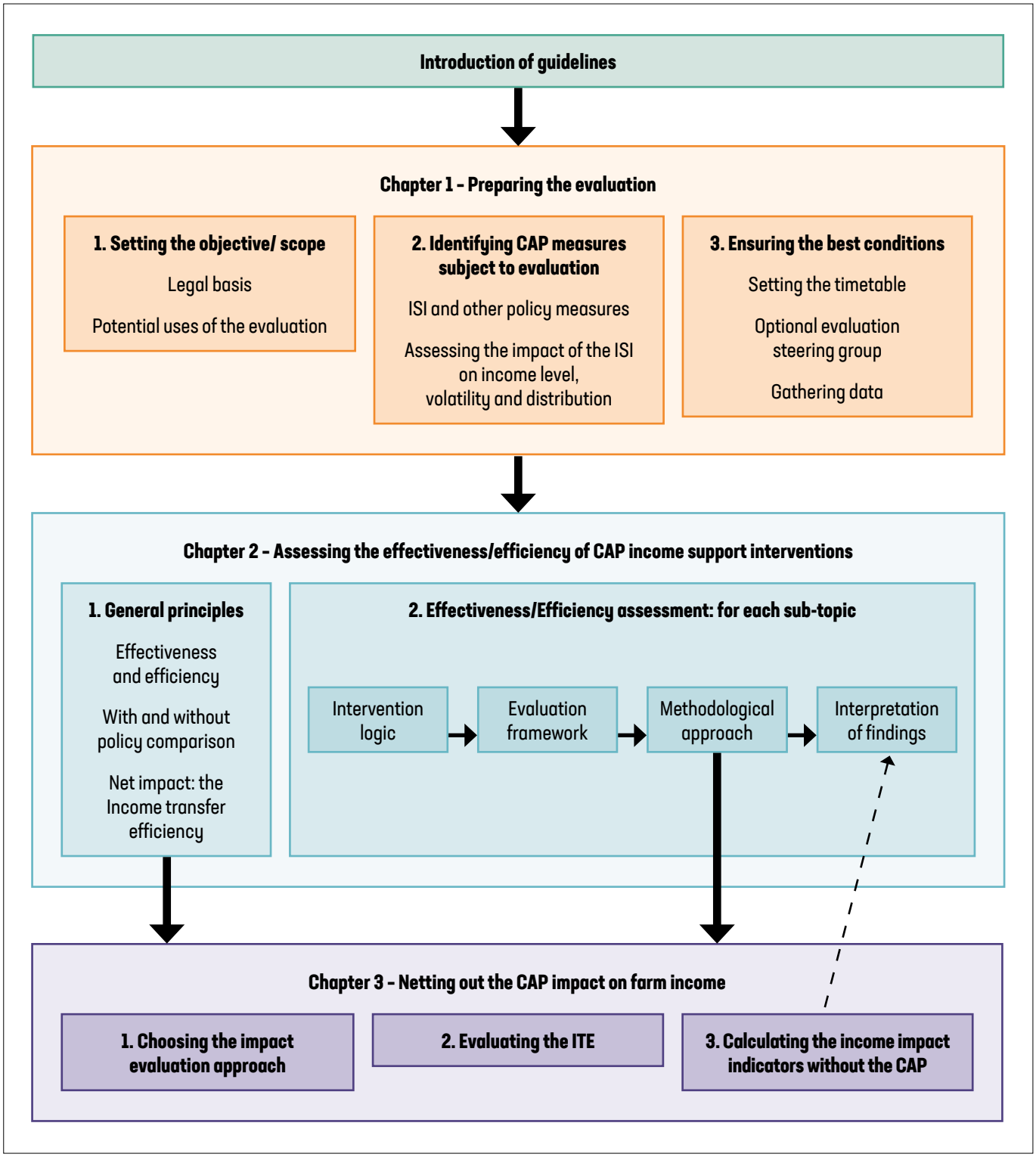
The guidelines are structured around three different sections:

- Chapter 1 describes the key aspects to consider prior to launching of an evaluation.
- Chapter 2 explains how to assess CAP income support interventions, using a suitable mix of methods and indicators. It considers how to assess the CAP effectiveness and efficiency on three different aspects (i.e. income level, income volatility and income distribution) and provide guidance on how to interpret the findings from the analyses to conclude on the effects of a policy.
- Chapter 3 focuses on quantitative methods to net out the CAP impact on farm income indicators.

The diagram on the next page provides an overview of the guidelines' content.

[3] I.2 Evolution of agricultural income compared to the general economy, I.3 Evolution of agricultural income, I.4 Evolution of agricultural income level by type of farming (compared to the average in agriculture), I.5 Evolution of agricultural income in areas with natural constraints (compared to the average).

Figure 1. Content of the guidelines



Source: EU CAP Network supported by the European Evaluation Helpdesk for the CAP (2024)

1. Preparing the evaluation

1.1. Framing the evaluation

The purpose and scope of an evaluation will determine its design (e.g. which interventions, policy objectives and results, over what time period and for what geographical coverage).

This section intends to provide guidance to Managing Authorities and evaluators on how to clarify the purpose of an evaluation, considering legal provisions and the intended uses of evaluation findings. It also specifies how to define scope, which starts by considering interventions or the objectives to be evaluated.

1.1.1. Legal basis

According to the Article 1 of the Commission Implementing Regulation (EU) 2022/1475:

1. *When evaluating their CAP Strategic Plans, Member States shall define evaluation questions and factors of success to assess the evaluation criteria of effectiveness, efficiency, relevance, coherence and Union added value referred to in Article 140(1) of Regulation (EU) 2021/2115.*
2. *When assessing the effectiveness of their CAP Strategic Plans, Member States shall use the key evaluation elements set out in Annex I to this Regulation in accordance with the CAP Strategic Plans' intervention logic and, where relevant for their CAP Strategic Plans, the recommended factors of success set out in that Annex.*
3. *When assessing the efficiency of their CAP Strategic Plans, Member States shall analyse whether the effects or benefits of the CAP Strategic Plans were achieved at a reasonable cost and shall assess simplification both for beneficiaries and for the administration, with special focus on administrative costs and on the use of digital tools and satellites.*

According to Article 2(a) of Commission Implementing Regulation (EU) 2022/1475, Member States shall evaluate each Specific Objective (SO) at least once during the implementation period, if relevant, in accordance with the CSP's intervention logic.

Article 6 of the same regulation further indicates that this regulatory evaluation should be based on the PMEF, and that "Member States shall quantify the contribution of the CAP Strategic Plans to the development of at least the common impact indicators set out in Annex III to this Regulation". The agricultural income related impact indicators [4] of Annex III are presented in the table below.

Table 1. Income related impacts indicators referred to in Article 6(5) of Commission Implementing Regulation (EU) 2022/1475

Indicator code	Indicator name
I.2	Reducing income disparities: Evolution of agricultural income compared to the general economy
I.3	Reducing farm income variability: Evolution of agricultural income
I.4	Supporting viable farm income: Evolution of agricultural income level by type of farming (compared to the average in agriculture)
I.5	Contributing to territorial balance: Evolution of agricultural income in areas with natural constraints (compared to the average)

Source: Annex III of Commission Implementing Regulation (EU) 2022/1475

These impact indicators are those associated with the key element 'viable farm income' as detailed in Annex I of Regulation (EU) 2021/2115 [5].

Assessing CAP effects on viable farm income

To assess the effectiveness of CAP income support instruments on farm income, the relevant evaluation framework can be drawn from the specifications provided in Annex I of Commission Implementing Regulation (EU) 2022/1475. In the annex, viable farm income is presented as a key element to assess when considering the achievement of SO1 and described as a "stable income but also fairly distributed income". The annex also recommends considering the following factor of success to assess the effects achieved by the CSP on viable farm income: "Agricultural income level in farms supported is increasing or, at least, is stable and disparities between farms and to other economic sectors are decreasing, taking into account general economy trends".

Based on the specifications from Annex I, three different factors of success are suggested by the Evaluation Helpdesk to consider the potential effects of CAP income support interventions and establish a clear link with the impact indicators provided in Annex III of Commission Implementing Regulation (EU) 2022/1475.

[4] For the full list of Context and impact indicators, see: https://agriculture.ec.europa.eu/system/files/2023-02/pmef-context-impact-indicators_en.pdf

[5] As these guidelines focus on the income level, stability and distribution, the impact indicator I.26 Distribution of CAP support is not considered here.

Table 2. Suggested factors of success for the assessment of CAP effects on 'viable farm income'

Key element from Annex I	Suggested factors of success	Corresponding impact indicators listed in Annex III
Viable farm income: Viable farm income means not only stable income but also fairly distributed income.	Agricultural income level in farms supported is increasing or, at least, stable	I.3 Reducing farm income variability: Evolution of agricultural income
	Income disparities between supported farms are decreasing	I.4 Supporting viable farm income: Evolution of agricultural income level by type of farming (compared to the average in agriculture) I.5 Contributing to territorial balance: Evolution of agricultural income in areas with natural constraints (compared to the average)
	Disparities between agricultural income level in farms supported, and the income level in the other economic sectors are decreasing	I.2 Reducing income disparities: Evolution of agricultural income compared to the general economy

Source: EU CAP Network supported by the European Evaluation Helpdesk for the CAP (2024) – own suggestions based on Commission Implementing Regulation (EU) 2022/1475

This suggested framework may be further developed and complemented by Member States with other judgement criteria/ factor of success (e.g. addressing CAP effects on income volatility), indicators reflecting either qualitative or quantitative information. Notably, and the PMEF output and results indicators linked by Member States to SO1 key element 'viable farm income' [6]. An indicative list of PMEF output, result and context indicators relevant for the assessment of this key element is provided in Annex I for each factor of success. In chapter 2, this framework is further developed with suggestions for additional judgement criteria and indicators in relation to the three topics under consideration (income level, stability and distribution).

Legislative framework for assessing the efficiency of CAP income support interventions

When assessing the efficiency of CAP income support instruments, Member States must analyse whether the effects or benefits of the CAP Strategic Plans are achieved at a reasonable cost [7]. However, the regulation does not recommend a specific factor of success for assessing the efficiency of CAP income support interventions (i.e. for considering if the effects are achieved at a reasonable cost).

In this case, the efficiency of income support interventions can simply be considered by comparing their costs (i.e. budget implemented and/or other transaction costs) with their effects on farm income.

1.1.2. Defining the scope and the evaluation questions

The scope of the evaluation specifies which interventions and policy objectives are to be evaluated. This will be reflected in the evaluation framework that sets out the evaluation questions and related factors of success addressing specific evaluation criteria (effectiveness/ efficiency in the context of these guidelines).

Developing evaluation questions by considering the intervention logic

Establishing or reviewing an intervention logic can be a starting point for the development of specific evaluation questions linked to the initial expectations of a policy intervention [8].

The intervention logic reflects how interventions were expected to work, including the underlying assumptions. It can draw from any prior impact assessment or other documentation which justifies a policy action and describes expected outcomes and impacts of implemented interventions.

The intervention logic is generally translated into a diagram that describes the problem or the needs identified and the expected logic of the intervention (or the different steps) that should lead to the intended change (see section 1.2.2 where a theoretical intervention logic diagram is provided). Hence, it highlights the theoretical 'cause and effect' relationships, e.g. how actors are expected to react, what

[6] The new delivery model provides enhanced flexibility to the Member States to establish their intervention logic and define how each intervention is going to contribute to the different specific. objectives. This means that the links between interventions – and corresponding output indicators – result indicators, and Specific Objectives may differ among Member States.

[7] Article 1(3) of Commission Implementing Regulation (EU) 2022/1475.

[8] European Commission. The Better Regulation Toolbox; https://commission.europa.eu/law/law-making-process/planning-and-proposing-law/better-regulation/better-regulation-guidelines-and-toolbox/better-regulation-toolbox_en

actions are expected to be triggered by CAP interventions, which interactions between actors and actions will lead to changes over time and to the achievement of policy objectives.

Thus, to prepare the evaluation of the CAP impact on farm income, it is recommended to list the CAP interventions programmed in a CSP to support farm income under the given objectives, and to **highlight the expected mechanisms involved between the types of CAP interventions and the effects on farm income impact indicators**. The evaluation questions and corresponding factors of success should then be established to question the expected effects of relevant CAP interventions.

Box 1. Examples of evaluation questions to assess CAP income support interventions

Effectiveness questions examine the outcomes and impact of implemented interventions. They can assess the effects of each intervention separately and/or consider effects achieved by a whole policy (set of interventions). Examples of evaluation questions for assessing the effectiveness of CAP income support interventions are shown below. Member States may use them as inspiration to develop their own questions in accordance with the intervention logic of their CAP Strategic Plan for supporting viable farm income.

- To what extent have the combined CAP income support interventions, and in particular BISS, CRISS and CIS, contributed to increase farm income levels? In which farm types, farm sizes and areas have CAP income support interventions contributed to increase farm income?
- To what extent did CAP income support interventions help to reduce the gap between average farmers' income and average income in the economy?
- To what extent did BISS contribute to stabilising farm income over time? What were the sectors most affected by farm income volatility over the current programming period and how did CAP income support interventions contribute to reducing income volatility?
- To what extent did CAP income support interventions contribute to reducing farm income disparities between farm types, farm sizes and areas? How did CRISS affect the distribution of CAP funds between larger farms and smaller sized farms? To what extent did CAP income interventions support farmers' income in ANC?

Efficiency questions compare the effects achieved to the financial and administrative resources engaged for the implementation, either of CAP income support interventions as a whole or for each specific intervention separately. The efficiency analysis will build on findings from the effectiveness analysis, therefore evaluation questions need to reflect the aspects addressed by the following effectiveness questions:

- To what extent were the benefits/impacts on farm income level, stability and distribution achieved with the lowest expense?
- What is the Income Transfer Efficiency of CAP income support interventions, i.e. what share of income support is effectively transferred into farm income?

Source: EU CAP Network supported by the European Evaluation Helpdesk for the CAP (2024)

Clarity on the intended use of the evaluation findings

Clarity on the intended use of evaluation findings will allow the formulation of concrete objectives and the establishment of a clear mandate for evaluators. Hence, the objectives of an evaluation can be defined by considering the needs from the Managing Authority, as well as needs from other stakeholders (e.g. the Paying Agency, any implementing bodies or regional authorities, farmers, environmental NGOs). This entails involving the relevant stakeholders interested in CAP income support in the evaluation process (see section 1.3.1 Engaging the target audience in the evaluation process).

1.2. Identifying CAP instruments subject to evaluation

Supporting agriculture income is an important objective of the CAP, which entails several interventions aimed at delivering payments according to farm characteristics.

Under the CAP in the 2023-2027 programming period, changes were made to the existing income support system to ensure a fairer distribution of financial support for farmers across the EU.

1.2.1. Objective of income support

Income support complements farm income to ensure a fair standard of living for the agricultural community (as one of the CAP objectives stated under Article 39 of the Treaty on the Functioning of the European Union [9].

Following several reforms, CAP income support is now mostly granted in the form of a decoupled support per hectare. CAP decoupled payments have generally remained stable over time and provide a basic guarantee to farmers in a context of growing price volatility and climatic risks.

In addition, the provision of coupled support can address difficulties that are specific to a particular sector, production type or farming method, while the complementary redistributive income support allows to target smaller farms.

The CAP also provides additional income support for farms in areas with specific needs, notably for areas facing natural or other specific constraints.

The level of support granted to farms varies greatly both among and within Member States, depending on farm sector characteristics, farm sizes and locations, Member States' allocations (as established under Annex V of Regulation (EU) 2021/2115) and choices within the flexibilities offered by the CAP's legal framework [10].

1.2.2. Description of CAP interventions supporting farm income and their rationale, including a theoretical intervention logic

Under the 2023-2027 CAP programming period, SO1 aims at "supporting viable farm income and the resilience of the agricultural sector across the EU, in order to enhance long-term food security and agricultural diversity, as well as to ensure the economic sustainability of agricultural production".

In CSPs, all interventions have to be linked to the SO(s) that it was designed to contribute to. Each intervention was also assigned a financial allocation. From the total financial allocations for interventions linked to SO1 in the 28 CSPs, 53% stems from the support allocated to Basic Income Support for Sustainability (BISS). CRISS, CIS and ANC also represent an important share of the total allocations to interventions linked to SO1. Hence, these are the interventions considered most relevant by Member States in relation to advancing towards SO1. The design of these interventions has a common feature to provide payment to farmers without requiring a specific counteraction (beyond the good agricultural environment conditions (GAECs) that farmers have to respect to benefit from area- and animal-based CAP support). Thus, farmers can qualify for the payments either by producing or maintaining land according to these conditions. Two other interventions have similar design features: CIS-YF, a payment obtained by young farmers, and support for ASD, a payment that may be distributed to farms in areas that are affected by certain EU directives. The total financial allocations to the latter two interventions are significantly lower than those for the four interventions mentioned above, which is why their importance in relative terms to SO1 may be smaller. However, for certain groups of farms these payments may make a big difference to their agricultural income [11].

Below is a more detailed description of the interventions considered of most relevant to SO1, with expected direct effects on farm income of beneficiaries.

BISS has replaced the basic payment scheme (BPS) and the single area payment scheme (SAPS). It provides direct income support for farmers to underpin their continued sustainability and economic viability. BISS is provided in the form of an annual decoupled payment per eligible hectare. In 2023, the support is to be paid as a uniform amount per hectare in 18 Member States, whereas in nine Member States the support is granted on the basis of payment entitlements (Article 23 of the CSP regulation) [12], allowing Member States to provide different levels of support to different geographical areas. In other words, these Member States may decide to differentiate BISS support by groups of territories faced with similar socio-economic or agronomic conditions, including traditional forms of agriculture as determined by the Member States. These Member States do however have to respect the rules on internal convergence, e.g. the mechanism designed to progressively lead to equal levels of BISS across all agricultural areas in a Member State [13]. In some cases, Member States can decide to offer a payment to small farmers that replaces all the other direct payments for simplification purposes, see further explanation below.

CRISS is designed to redistribute CAP funds from larger farms to medium and smaller sized farms. It must entail at least 10% of the direct payment envelope (except in case of derogation) [14]. CRISS is paid to all active farmers on their first hectares. Different ranges of support are possible and Member States define the relevant area-based threshold(s) depending on their needs. Applicants must be eligible for BISS to be able to receive payment under CRISS. It takes the form of an annual decoupled payment per eligible hectare to farmers. The amount per hectare planned for a given claim year

[9] Article 39 (Ex article 33 TEC) of the Treaty of the Functioning of the European Union, 202 OJ C (2016). http://data.europa.eu/eli/treaty/tfeu_2016/art_39/oj/eng

[10] Member States can transfer funds between the two Pillars (for example from Pillar 2 to Pillar 1 in order to pay a higher Basic Income Support per hectare).

[11] For a more detailed description see: European Commission, Directorate-General for Agriculture and Rural Development, Chartier, O., Krüger, T., Folkeson Lillo, C. et al., Mapping and analysis of CAP strategic plans – Assessment of joint efforts for 2023-2027, Chartier, O.(editor), Folkeson Lillo, C.(editor), Publications Office of the European Union, 2023, https://data.europa.eu/doi/10.2762/71556

[12] Regulation (EU) 2021/2115.

[13] See further explanation of internal convergence below, in relation to the description of 'other mechanisms'.

[14] According to Article 98 of the Strategic Plan Regulation, at least 10% of the allocations set out in Annex IX (adjusted direct payment envelopes) shall be reserved annually for the redistributive income support referred to in. Article 29. However, Member States may ask for a derogation from this rule.

should not exceed the national average amount of direct payments per hectare for that claim year [15].

Coupled income support (CIS) – Member States are allowed to grant coupled support in order to improve competitiveness, sustainability or quality in certain sectors and productions that are particularly important for social, economic or environmental reasons and encounter certain difficulties [16]. CIS shall take the form of an annual payment per hectare or animal head. When designing CIS, Member States should consider their potential impact on the internal market. In order to ensure a level playing field between farmers, a maximum allocation of direct payments that may be allocated to CIS is set at 13% [17].

Areas facing natural or other area-specific constraints (ANC) are those that are more difficult to effectively farm due to specific problems caused by natural or other specific constraints. Member States can choose to provide specific income support payments to farms located in designated ANC areas from the rural development fund. Payments for natural or other area-specific constraints compensate farmers for costs incurred and income foregone related to the natural or other area-specific constraints of the designated area. Member States may decide to compensate for all, or part of such additional costs incurred and income foregone. They are granted annually per hectare of agricultural area.

Area-specific disadvantages resulting from certain mandatory requirements (ASD) – ASD payments are compensatory payments provided to beneficiaries for all or part of additional costs and income foregone related to area-specific disadvantages arising from Natura 2000 areas, other delimited nature protection areas with environmental restrictions applicable to farming, or forestry and agricultural areas included in river basin management plans. Payments under this article shall be granted annually per hectare.

Complementary income support for young farmers (CIS-YF) can be provided to young farmers who are newly set up for the first time and who are entitled to basic income support. The support is granted in the form of an annual payment per eligible hectare or an annual-lump sum.

Some Member States have linked the eco-schemes (schemes for climate, the environment and animal welfare) to SO1. However, this intervention is not considered as an income support intervention in the frame of these guidelines because of its rationale. Indeed, eco-schemes deliver compensation to farmers for undertaking specific agricultural activities that imply income loss and transaction costs. Hence, it is not a pure 'income support' intervention, even if eco-schemes can have an impact on farm income, depending on the level of support granted when compared to the costs incurred for the implementation of the required agricultural activities. Therefore, the assessment of their induced effects on income would require a different approach than those considered in these guidelines.

Aside from these CAP interventions, the regulation introduces mechanisms influencing the level and distribution of CAP payments granted to farmers:

- Capping and degressivity intend to contribute to fairer and more targeted distribution of income support. Member States may cap or reduce the BISS payment granted to a farmer above a certain ceiling for a given calendar year [18].The estimated remaining amount of the payment reduction should be used primarily to contribute to financing CRISS (if programmed in the CSP) or for other decoupled direct payments interventions or be transferred to finance rural development interventions.
- Internal convergence requires Member States that do not currently apply a flat rate payment of BISS (e.g. when BISS is implemented through payment entitlements) to ensure a convergence of the value of payment entitlements towards a uniform unit value by the claim year of 2026, at the latest. Some Member States decide to reach a flat rate in 2026 while some others continue with different values of payment entitlements. For the latter, Member States must ensure that by 2026 at the latest, all payment entitlements have a value of at least 85% of the national average payment entitlement unit amount for CY2026. These Member States are also required, by 2026 at the latest, to set a maximum level for the value of individual payment entitlements for the Member State, or for each group of territories faced with similar socio-economic or agronomic conditions. Increases in the value of payment entitlements below the national average unit amount must be financed by reducing the value of payment entitlements that are above the national average. The convergence mechanism aims to bring payment entitlement values towards a national or territorial average value.
- Payment for small farmers can be offered as optional and consist of a lump-sum of amounts per hectare, potentially linked to different area thresholds. It replaces other direct payments while Member States cannot plan a lump-sum exceeding EUR 1 250.

As described in section 1.1.2, an intervention logic (IL) helps the evaluator to structure the analysis and to decide on which interventions (and other instruments) should be considered. It is thus recommended to include an IL at the outset of an evaluation to define the scope of the study and its intended purpose. In the CSPs, Member States have included an intervention strategy for SO1 by linking the designed interventions to defined needs associated with farm income and establishing the link between these interventions and relevant indicators.

Below follows a theoretical IL for the CAP income support interventions described above, based on the description of the interventions in Commission Implementing Regulation (EU) 2021/2115 and a theory-based analysis of their expected effects.

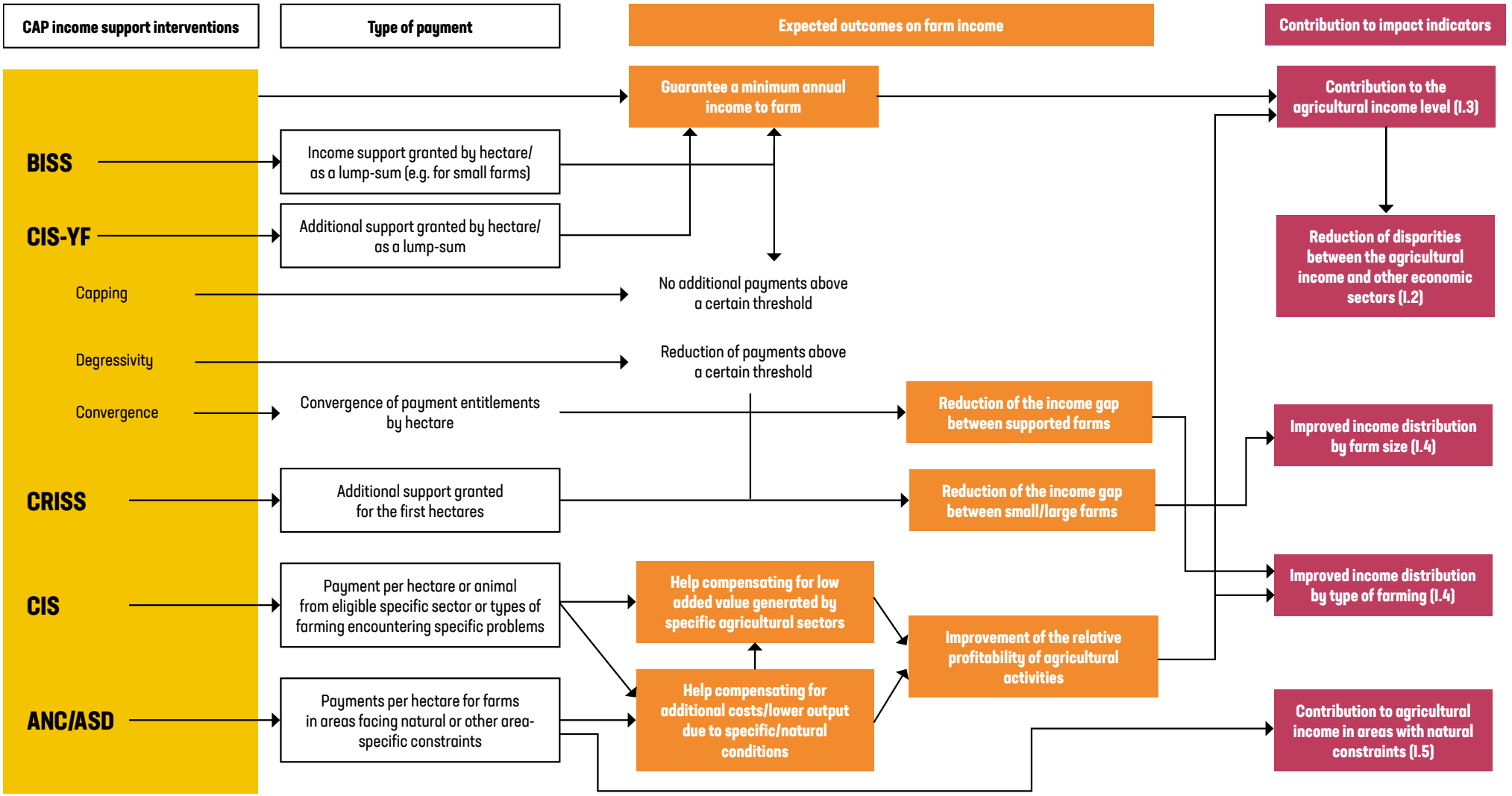
[15] The national average amount of direct payments per hectare is defined as the ratio of the national ceiling for direct payments for a given claim year laid down in Annex V and the total planned outputs for the basic income support for that claim year, expressed in number of hectares.

[16] Recital 66 of Regulation (EU) 2021/2115.

[17] Maximum financial allocation for CIS is set at 13% of their direct payment allocations (Annex IX of the SPR). An additional 2% may be allocated to CIS in case the funding is directed to protein crops. Member States shall not be required to demonstrate the difficulties encountered in relation to protein crops (which is required for the other sectors supported) to reduce the EU's deficit in this regard. Furthermore, Member States should be able to support mixtures of legumes and grasses under coupled income support as long as legumes remain predominant in the mixture. In addition, (Member States may request a derogation based upon either (1) the 5th paragraph of Article 96 (i.e. to use up to EUR 3 million to coupled income support instead of the maximum 13(+2)% based upon Article 96(1) and (2)of SPR), this is applied only by MT, or (2) for PT, BE and FI, a derogation based upon Article 96(2) of the SPR may be applied due to historical reasons (i.e. to exceed the maximum of 13% of the amounts set out in Annex IX of the SPR with regard to CIS, but not exceeding the corresponding percentage that the Commission approved for voluntary coupled support for claim year 2018).

[18] Member States may cap (reduce by 100%) the BISS amount exceeding EUR 100 000. Member States may apply reduction to BISS payments exceeding EUR 60 000 by up to 85%; Member States may set additional tranches above EUR 60 000 and specify the percentages of reduction for those additional tranches.

Figure 2. Intervention logic of CAP income support interventions



Source: EU CAP Network supported by the European Evaluation Helpdesk for the CAP (2024) based on Regulation (EU) 2021/2115

It explores the links between these interventions and the income related impact indicators. It analyses the expected outcomes that should contribute to supporting income level and stability (I.3) and reduces income disparities (I.2, I.4 and I.5). This theoretical IL can be used as a model to define the scope and aspects to be examined during the evaluation. The CAP interventions analysed, expected outcome and indicators used to assess the extent of this outcome are all variables that may be freely modified depending on the scope and objective of the evaluation.

1.2.3. Assessing the impact on income level, volatility and distribution

The analysis of the role played by the CAP interventions on farm income requires to first define the key concepts.

Definition of farm income

Farm income is the portion of agricultural output value that can be used to remunerate the fixed factors of production (labour, land and capital), whether they are external or family-owned factors. In indicator C.27, the PMEF considers the FNVA to measure farm income by type of farming, region, farm size and areas. According to the EU definition, the FNVA can be compared regardless of the family/non-family nature of the factors of production used and this income indicator is thus suitable to reflect, compare and aggregate farm income of any type of agricultural holding.

Another indicator of farm income is family farm income (FFI), which represents the final portion of the agricultural output that returns to the farmer for the use of his own production factors.

The table below indicates how to calculate the FNVA and the FFI. It shows which elements must be added/removed from the agricultural output value to obtain these indicators.

Farm income is generally measured as per annual work unit (i.e. full-time equivalent employment in agriculture) or family work unit (i.e. a non-paid full-time equivalent farm job) [19] to take into account the differences in the scale of farms and provide comparable indicators.

FNVA and FFI are calculated from data collected under the EU's farm accountancy data network (FADN) and, by construction, consider commercial farms exceeding certain economic size thresholds set at national level. Being farm-based, these indicators allow comparisons among categories of agricultural holdings, such as farm size classes, types of farming activity, regional clusters, etc. However, they require a longer validation process that implies a certain delay in data availability.

Table 3. Structure of Farm Net Value Added (FNVA) and Family Farm Income (FFI)

Positive components	Negative components
+ Total output (value of agricultural production)	
+ Subsidies on production and costs	
	› Intermediate consumption **a)** *Specific cost:* *Seeds and plants* *Fertilisers* *Crop protection* *Other crop specific cost* *Feed grazing livestock* *Feed pigs and poultry* *Other livestock specific cost* **b)** *Overheads:* *Machinery and building costs* *Energy* *Contract work* *Other direct inputs*
	› Taxes and VAT balance
= Gross farm income or gross value added	
	› Depreciation
= FNVA	
+ Investment grants and subsidies	
	› External factors: *Wages paid* *Rent paid* *Interest paid*
= FFI	

Source: EU CAP Network supported by the European Evaluation Helpdesk for the CAP (2024), based on EU Farm economics overview – FADN 2018 [20]

[19] Understanding farmer income. (2019). European Parliamentary Research Service. https://www.europarl.europa.eu/thinktank/en/document/EPRS_ATA(2019)637924

[20] For more information see: https://agriculture.ec.europa.eu/cap-my-country/performance-agricultural-policy/studies-and-reports/analytical-briefs/agricultural-and-farm-economics_en#overview

Eurostat distinguishes two different concepts related to the measure of **agricultural income** which data are collected under the EU Economic Accounts of Agriculture (EAA): agricultural factor income and agricultural entrepreneurial income.

Agricultural factor income is a measure of remuneration of the factors of production (land, capital and labour) regardless of their type of tenure. It therefore corresponds to the value of agricultural production plus subsidies, minus certain costs and taxes, both for family farms and corporate holdings. Agricultural entrepreneurial income is agricultural factor income less payments of wages, rent and interest, which then remunerates own production factors. Agricultural factor income is considered in the PMEF as I.3 to measure the evolution of agricultural income. It is calculated as follows:

Table 4. Structure of Indicator I.3 - Agricultural factor income

Positive components	Negative components
+ Value of agricultural production	
	› intermediate consumption › depreciation › total taxes (on products and production)
+ total subsidies (on products and production)	
= Agricultural factor income (net value added at factor costs)	

Source: Towards the PMEF
https://agriculture.ec.europa.eu/common-agricultural-policy/cap-overview/cmef_en#towardsthepmef

Stemming from a common methodological framework of national accounts, the measures of the average agricultural factor income allow comparisons with the average wages in the rest of the economy.

Farm income is considered viable when it helps farmers face the risks inherent to their business. Hence, **farm income level, distribution and volatility** can affect farm economic viability in a significant manner.

Farm income level, volatility and distribution

Farm income level must be sufficient to compensate for all factors of production (land, capital and labour) regardless of whether they are owned or borrowed/rented. Family farm income represents the financial reward to all members of the family who work on the farm for their labour, management and investment. Farm income/AWU represents the level of income in the agricultural sector, which can be compared to the average income in other economic sectors.

Farm income volatility refers to the fluctuations in farm income level over time. This can be due to various factors such as changes in prices, yields and market conditions. These fluctuations can significantly affect the financial stability of farmers and the overall agricultural sector.

Farm income distribution, as defined within the framework of the CAP, refers to the level of inequality of income among farms. Inequality can be assessed by comparing the income level of groups of farms differing according to, for example, farm sizes, types of farming and regions. Income distribution can be also be assessed considering the whole distribution of income over the entire population.

1.3. Ensuring the best conditions for the evaluation

1.3.1. Engaging the target audience in the evaluation process

Evaluations can be useful both for their findings and the process followed during their planning and implementation.

Benefits can be achieved through the evaluation process. The Managing Authority needs to explore potential gains that could arise from interactions with other stakeholders involved in the evaluation (e.g. research institutes, Paying Agency, farmers' unions etc.). Building on that, they can organise the evaluation process and structure the evaluation to maximise interactions and improve social capital among stakeholders.

Box 2. Defining and engaging the target audience of the evaluation

Identifying the relevant stakeholders and engaging them throughout the evaluation process, according to their capacity to affect decision making and their interest in CAP income support, is an essential step in evaluation planning. It may contribute to a more comprehensive and inclusive evaluation design that responds to the needs of the different stakeholders, but also helps build an evaluation culture and promotes evidence-based policymaking.

Stakeholder mapping

Managing Authorities should identify who will use or be affected by the evaluations and how. A stakeholder mapping exercise can help identify and understand stakeholders' needs, perspectives and interests in the evaluation.

An example of a stakeholder mapping method can be found on the Evaluation Helpdesk's Toolbox [21] developed in the context of supporting Managing Authorities in the development of the evaluation plan.

Monitoring Committee

The CSP Monitoring Committee, with its broad representation of stakeholders, examines the progress and follow-up of evaluations as well as any changes to the evaluation plan.

Evaluation steering group

For managing and steering certain evaluations, the Managing Authority may decide to set up an optional evaluation steering group and involve selected members of the Monitoring Committee or other stakeholders (e.g. representatives from NGOs, National CAP Network and other actors identified through the stakeholder mapping). Its tasks may comprise the drafting of terms of reference, selecting contractors, and accompanying the evaluation process to ensure a high quality and that stakeholders' concerns are sufficiently considered [22].

Source: EU CAP Network supported by the European Evaluation Helpdesk for the CAP (2024)

[21] Tool 3: Stakeholder mapping, https://eu-cap-network.ec.europa.eu/publications/guidelines-design-evaluation-plans_en.

[22] For a more detailed description of the levels of stakeholder engagement see the 'Spectrum of Stakeholders Engagement' developed by the International Association for Public Participation: https://www.iap2.org/.

1.3.2. Establishing an optional evaluation steering group

The role of a possible evaluation steering group can be key as it may determine the quality of the evaluation report. Hence, its establishment and composition will be carefully considered by the Managing Authority, as well as the time needed to invite the different members and explain their responsibilities.

An optional evaluation steering group may include relevant topical and technical knowledge to facilitate the evaluation work and provide informed decisions when methodological decisions or data interpretation is needed. It also ensures that different perspectives are pooled to foster discussions and encourage critical judgement.

Box 3. Possible composition of an evaluation steering group

In evaluations of CAP income support interventions, members with core expertise in economic analysis, scientific research, and analytical models can significantly improve the quality of the evaluation by controlling the work and challenging the technical team when the methodology implemented does not correspond to the approach initially agreed upon.

Source: EU CAP Network supported by the European Evaluation Helpdesk for the CAP (2024)

Evaluation steering group members can guide the evaluation by validating the methodological decisions, controlling the timely delivery of output and achievement of expected outcomes.

The evaluation steering group may already be involved in the design of the evaluation and/or the preparation of the technical specifications. During the evaluation process, its members need to ensure sufficient time to follow the implementation of the evaluation stages and discuss the difficulties faced and potential solutions to overcome them. Hence, meetings are set at different stages of the evaluation to cover the important elements. Members can also read and comment on the different reports delivered, particularly when evaluations are running over a long period.

1.3.3. Setting the right timing

The timing of the evaluation may be specified in the CSP's evaluation plan and will depend on the intended use of its findings, the nature of the underlying interventions and when the effects can be observed. These aspects must be carefully considered to manage expectations about what the evaluation will realistically be able to deliver.

Availability of data

Data availability determines the types of analyses that can be done and the ability of demonstrating CAP effects based on sound and robust findings.

However, output data are not immediately available, as they need to be collected, checked, reported, processed, etc. More precisely, the direct payment 2023 claims will be paid in financial year 2024 (from October 2023 to June 2024) and then reported to the Commission in the annual performance report in February 2025. As such, the first analyses on CAP income support distribution can be implemented when output data are reported and available at Member State level.

Moreover, specific analyses and methods (e.g. on income stability) require observations over a significant period of time to accurately reflect the trends observed (see chapter 3).

Hence, before launching an evaluation, it is important to consider the data available and understand that 'the more you wait, the more data will be available'. One possibility to overcome issues associated with data availability, is to examine data from previous programming periods.

Box 4. Use of data from previous programming periods

In principle, data from the previous programming period can be used for the analysis of the CAP effects on farm income. Indeed, the CAP income support interventions implemented in 2023 are most often in continuity with the CAP instruments and measures programmed under 2014-2022. This allows for the use of data from previous programming periods to examine the nature of causal relationships between CAP income support interventions and observed changes in farm income, as long as the actual changes in policy are acknowledged. The table below gives insight on the potential for using data from previous programming period depending on the intervention.

	Analysis of the continuity with the previous programming period	Use of data from 2014-2022 programming period	Potential changes to acknowledge for the analysis
BISS	BISS is the continuity of basic payment scheme (BPS) and the single area payment scheme (SAPS).	Data on BPS and SAPS implementation can be used for the analysis.	Changes implemented regarding internal and external convergence, to the distribution of payment entitlements and to the application of capping, degressivity and convergence, might have generated changes in the unit amounts over the two programming periods.
CRISS	CRISS is the continuity and upgrade of the redistributive payment.	Data on redistributive payments can be used for Member States that have implemented it.	Redistributive payment was voluntary and implemented in only ten Member States. Moreover, the percentage of the national envelope used for CRISS/ redistributive payment may have changed.
CIS	CIS is the continuity of voluntary coupled support (VCS).	Data on VCS implementation can be used for the analysis of sectors that were targeted over the two periods.	Sectors targeted and unit amount might have changed between the two programming periods.
ANC	ANC support also existed for the 2014-2022 period.	Data on ANC implementation can be used for the analysis.	Eligible areas might have changed between programming periods, as well as the unit amount.
ASD	M12 of the RDPs (e.g. N2000 and WFD payments) also existed under the previous period.	Data on M12 implementation can be used for the analysis.	Eligible areas might have changed between programming periods, as well as the unit amount.
CIS-YF	CIS-YF is a continuity of the payment for young farmers from the previous programming period.	Data from the previous programming period can be used.	Potential changes in the implementation of support for young farmers should be acknowledged (e.g. type of payments and unit amount).

The methods recommended in these guidelines are more or less data intensive. For analyses that require long time series (e.g. analysis of volatility), the data from the previous programming period may be used, but the methods implemented and the supporting dataset should be adjusted to consider the potential changes in income support per farm, targeting, eligibility conditions, etc.

Source: EU CAP Network supported by the European Evaluation Helpdesk for the CAP (2024),

Intended use of the evaluation findings

The timing of the evaluation should also be adjusted regarding the potential uses of evaluation findings. EU regulation distinguishes evaluations carried out during the implementation period and those carried out ex post.

During the implementation of the CSP, evaluations can serve two different purposes:

- Improve the design and implementation of the CSP, considering how to better achieve its objectives.
- Provide information in time to be able to prepare subsequent CSPs after 2027 [23].

In case the Managing Authority wants to use the evaluation for improving the implementation choices for the current and next programming periods, then the evaluation timing needs to be adjusted to deliver the expected findings (e.g. recommendations regarding specific design aspects) and the evaluation questions need to reflect this.

- Evaluations aiming at assessing the effective design and implementation of the CSP will take place throughout the 2023-2027 period and address needs to improve specific interventions, administrative arrangements, etc.
- Evaluations aiming at improving the CAP after 2027 will be carried out in 2024/2025 to deliver results and formulate recommendations that can be considered in 2026 when designing the next CAP. However, these evaluations will build on output data from the first two years of implementation and on FADN data for only one year (2023), which might hinder the application of sound methodologies to assess CAP income support interventions. In this case, data from the previous programming period could be used to feed the analysis and reveal the causal relationships between policy implementation choices (e.g. type of support, budget, targeting etc.) and the effects on income.

In the ex post evaluation, the analysis of CAP effects on farm income will also be investigated for the assessment of the overall effects achieved by the CSP, General and Specific Objectives. A comprehensive ex post evaluation of the CSP must be completed by 31 December 2031 [24]. Starting in 2029, output and FADN data should be available for the entire program period and allow for a comprehensive investigation of the effects achieved.

23 Article 2(e) of Commission Implementing Regulation (EU) 2022/1475.
24 Article 140(6) of Regulation (EU) 2021/2115.

2. Assessing the effectiveness and efficiency of CAP income support interventions

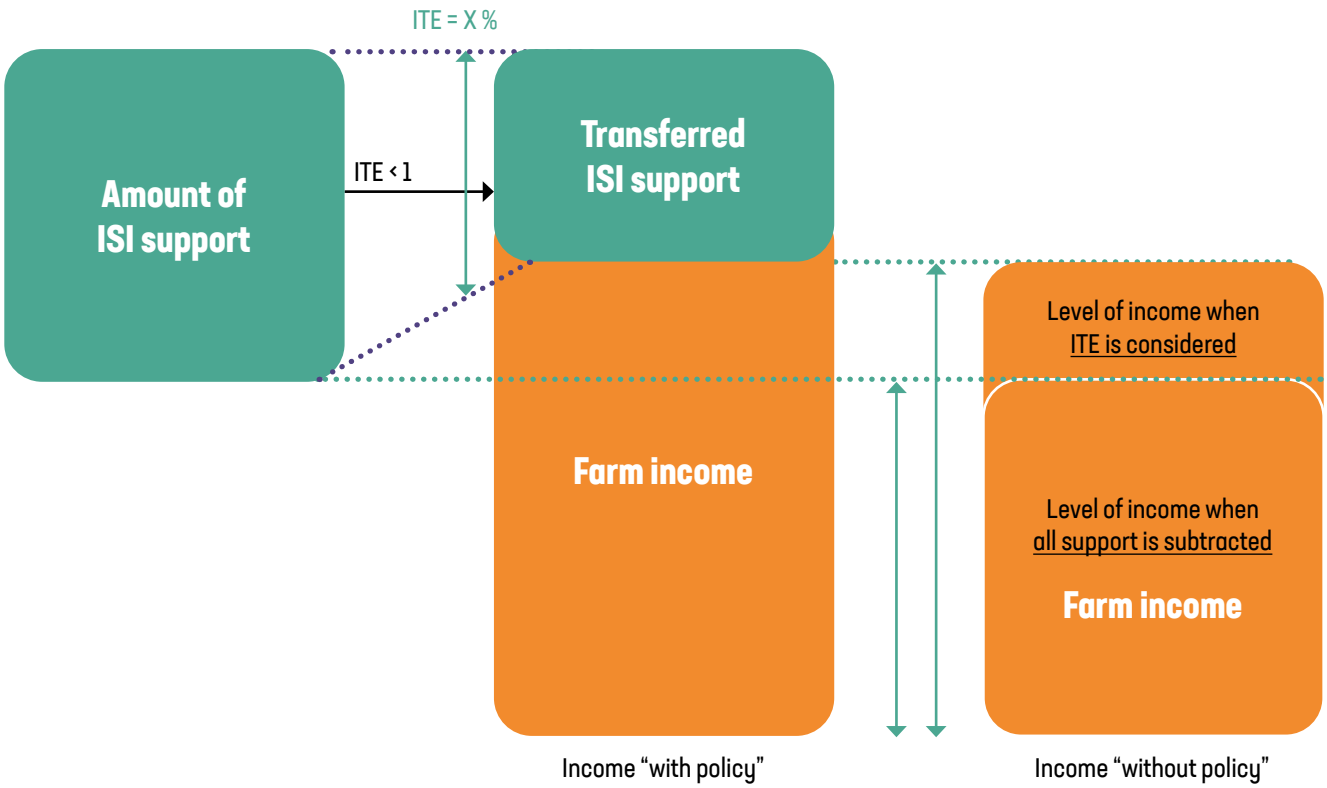
In this chapter, guidance is provided on how to assess the effectiveness and efficiency of income support interventions (ISI) with regard to income level, volatility and distribution. As defined in the guidelines' introduction, the effectiveness of a policy considers the extent to which an intervention achieved its objectives. In contrast, the efficiency of a policy refers to the effects achieved by an intervention in relation to the financial and administrative resources engaged for its implementation. While the two terms are clearly connected, they require different methodologies that are presented in this chapter.

2.1. General principles of the assessment

As the focus of the guidance is the assessment of ISI, a major methodological issue is the absence of a comparable counterfactual situation because CAP direct payments are delivered to most eligible farmers. The most straightforward way to assess the impact of the considered instruments is comparing the current situation (with the ISI in place), with a hypothetical situation in which the ISI are not in place. This is a typical 'with vs without policy' approach.

The 'without policy' scenario can, at a first glance, be obtained by subtracting the overall amount of support provided by ISI from the current income level. However, this simple approach disregards the fact that part of the support, even in the case of ISI, is not transformed into income. This concept is generally referred to as the Income Transfer Efficiency of a policy (OECD, 1996) [25]. Because of this, it is recommended to develop an additional scenario in which the current income is reduced by only a share of the support provided by ISI. Several approaches can be used to assess the level of ITE and the most important ones are presented in chapter 3 of this document.

Figure 3. Hypothetical situation 'without policy' using Income Transfer Efficiency



Source: EU CAP Network supported by the European Evaluation Helpdesk for the CAP (2024)

[25] OECD. (1996). Factors conditioning the transfer efficiency of agricultural support. In General Distribution (General Distribution). OECD Publishing.

It is not recommended to use a single coefficient for the ITE, as empirical analyses have shown that the level of the ITE strongly differs according to, among others: country, period, policy measures, income indicator, type of farming, farm size and amount of policy support. Small family-run farms may exhibit different income sensitivity compared to large, industrialised operators. Geographical and socio-economic environments can also generate differences across farm groups.

Meaning of the Income Transfer Efficiency and estimated levels

The level of ITE can be measured as the share of the support that results in an increase of farm income. For example, if farm income went up by one euro for each euro increase of policy support provided to a farmer, the ITE would be 1 (i.e. 100%). Agrosynergie (2020) reported ITE in the range of 0.1 to 1, depending on type of income support intervention and Member State. Biagini et al. (2020) found ITE coefficients between 0 and slightly more than one, spanning across different farm sizes and time horizon (short and long term). Finally, Ciliberti et al. (2022) estimated ITE coefficients from 0.03 (3%) to 0.4 (40%).

Hence, the first recommendation would be to estimate the ITE coefficient for the study group with the specific circumstances in which the assessment is to be developed. Alternatively, it is suggested that a representative level of ITE be used. This could be identified starting from the heterogeneous results of the empirical analyses that have been developed in the past in similar circumstances. While this is a 'second best' approach, it could be considered that some Member States may not have the time and capability to develop econometric analyses. Furthermore, it is recommended to develop the scenario without support, assuming all support is translated into income (ITE=1).

Finally, factors other than ISI can affect farm income levels. When observing farm income trends across time, it is important to account for the evolution of such factors (i.e. controlling for them) to isolate the net policy impact. Not all methods can adequately account for the changes induced by the introduction of CAP support on other factors, with an indirect impact on income.

2.2. Effects of CAP income support interventions on income level in farms supported

2.2.1. Objectives and context of the analysis

The aim of this section is to provide guidance for the analysis of the effects of CAP income support interventions on farm income levels. The effect is expected to be positive compared to a situation without support, as CAP income support interventions increase farm returns and, in this way, the remuneration of all factors used on the farm.

However, the distribution of CAP support may vary according to Member States choices and farm characteristics, whereas its corresponding impact on farm income can be more or less significative, depending on a farm's financial situation. This is why a thorough analysis of the situation is needed to assess the impact of the CAP income support on farm income by CAP instruments, farm size, farm types and for the different regions.

Income level is calculated as the 'market' income generated by the farm activities (i.e. receipts obtained by the sale of farm products and services to the market minus costs) plus the direct support provided by agricultural policy (see also section 1.2.3). The analysis of CAP effects on farm income level can be considered at two levels:

- At national level: the macro-economic analysis is based on national aggregated Eurostat data (economic accounts for agriculture (EAA)), in particular data on the agricultural factor income.
- At individual farm level: the micro-economic analysis considers the farm net income (FNI) or FNVA from the FADN, which allows to distinguish farm income level among sectors, farm types and locations (see Box 5 below). To compare income levels among farms, it is necessary to standardise the absolute income level according to the AWU. Therefore, the income level is defined as farm net added value/AWU or FNI/AWU.

Box 5. Farm typologies

The definition of farm typologies is a necessary preliminary step to be used in empirical assessment.

The assessment of CAP income support interventions requires the definition of farm typologies, accounting for the high heterogeneity of the farms' population with respect to a number of key characteristics related to type of farming, location, size and structure, all of them important factors influencing farm incomes. Additional characteristics can be considered to better reflect the potential diversity of the farms' population according to the context of the Member States (e.g. social parameters).

The classification of farms into specific typology groups is aimed at constructing internally homogeneous groups that are differentiated from other groups. In this sense, a 'typology' approach increases the meaningfulness of within-group analysis and the effectiveness of comparative analysis for a set of variables of interest across groups within the same population. It should be noted that the capacity of a database to provide with sufficient variables for farm characterisation will determine the possibility of building such detailed typologies. When information is scattered through different databases, building larger consolidated databases is requested.

Type of farming

The first dimension used to classify farms into different typology groups is the type of farming or production sector. Different sectors apply different production technologies, which have an impact on the employment of a variety of production inputs and, therefore, entail different cost structures. Furthermore, the type of farming activity influences a farm's ability to generate a certain level of income as some sectors tend to be more profitable than others (e.g. horticulture vs. arable crops). For these reasons, it would not be possible to effectively compare farms across different sectors. Moreover, the type of farming classification also allows for a first overall distinction of farms benefitting from coupled income support.

Farm location

An important dimension that effectively distinguishes different types of farms within the same sector and region is the location in areas facing natural or other specific constraints. The main 'area-related constraints' affecting farming activities are, for example, slope gradient (i.e. farms located in mountain *vs.* hill-plane areas), particular soil and climate conditions that may hinder productivity and distance from the main communication routes.

Farm size

Another key factor in differentiating farms, potentially having an important effect on level of farm income, is farm size (i.e. economies of scale). The construction of typologies must differentiate between small, medium and large size based on size thresholds that will be defined using sample distributions with respect to farms' economic size (measured on the basis of standard output).

Organisational form of the holding

Farms can be further classified according to the type of organisational form, depending on whether the holding is an individual family farm or a more complex type of enterprise, such as a partnership or other form that does not employ family labour.

The analysis of the effects of direct payments on income level can distinguish farm enterprises where most of the work is provided by external labour (i.e. non-family farms) and farms where a relatively large amount of labour is supplied by the farm manager and his/her family (i.e. family farms). Indeed, farms relying on external labour will use the FNVA to pay the wages of their employees, affecting the final disposable income.

Source: Evaluation of income effects of direct support, Agrosynergie (2011) [26]

2.2.2. Descriptive analysis

Based on the above considerations, an initial descriptive analysis of the agricultural sector may be useful to depict the overall context in which farm income can be assessed and the effects of CAP income support interventions can be evaluated, by considering for instance:

- The distribution of the farm population by type of farming, region, farm size, in ANC.
- The average farm income by type of farming, region, farm size, in ANC.

The following context indicators provided by the PMEF can be used for this type of analysis:

- Agricultural holdings (C.12)
- Utilised agricultural area (C.17)
- Farming in Natura 2000 areas (C.19)
- Areas facing natural and other specific constraints (C.20)
- Farm income by type of farming, region, farm size, in areas facing natural or specific constraints (C.27)

[26] Agrosynergie. (2011). Evaluation of income effects of direct support [Evaluation of CAP measures concerning sectors subject to past or present direct support – Lot 1: Horizontal issues]. https://op.europa.eu/en/publication-detail/-/publication/1ab836ce-38f1-4bed-873e-fe2a3477b0d2

The implementation of CAP income support interventions, their respective budget and targeting specific farm sizes, farm types, regions and/or specific areas will significantly influence the general effects achieved on income. Hence, the assessment of the CAP effects can be introduced by providing a description of the relevant CAP interventions implemented under the CSP to support farm income (as identified by the intervention logic).

The first aspect that may be considered is the financial allocation to each CAP intervention and the equivalent unitary amount delivered to beneficiaries and, in addition, the average farm income of CAP beneficiaries:

- Financial allocation to the different interventions, in absolute value and as a share of the total CAP financial allocation.
- Average CAP unitary amount granted under each intervention (i.e. computed as financial allocation divided by the number of beneficiaries/hectares/animal heads (in the case of CIS targeted to animal production)). The average can also be computed from disaggregated data on interventions and beneficiaries for monitoring and evaluation (DME), to get the average unit amounts granted to farms according to their size (UAA) and their location (region, ANC, etc.). When Member States offer different unit amounts to certain farm/production characteristics (permanent grassland, arable land, etc.), DME enables understanding the number, size and characteristics (gender, young farmers, etc.) of beneficiaries for each sub-category.
- Average farm income of CAP beneficiaries as compared to the average farm income by farm size, farm types, among regions and specific areas.

Then, the share of farms benefitting from the different CAP income support interventions indicates to which extent the support concerned the whole or only a specific part of the farm population.

Examples of figures based on CATS [27] data reflecting the number of applicants or average unit amount granted under CAP income support interventions are provided in the following page:

[27] Clearance of Accounts Audit Trail System (CATS), now replaced by data for monitoring and evaluation.

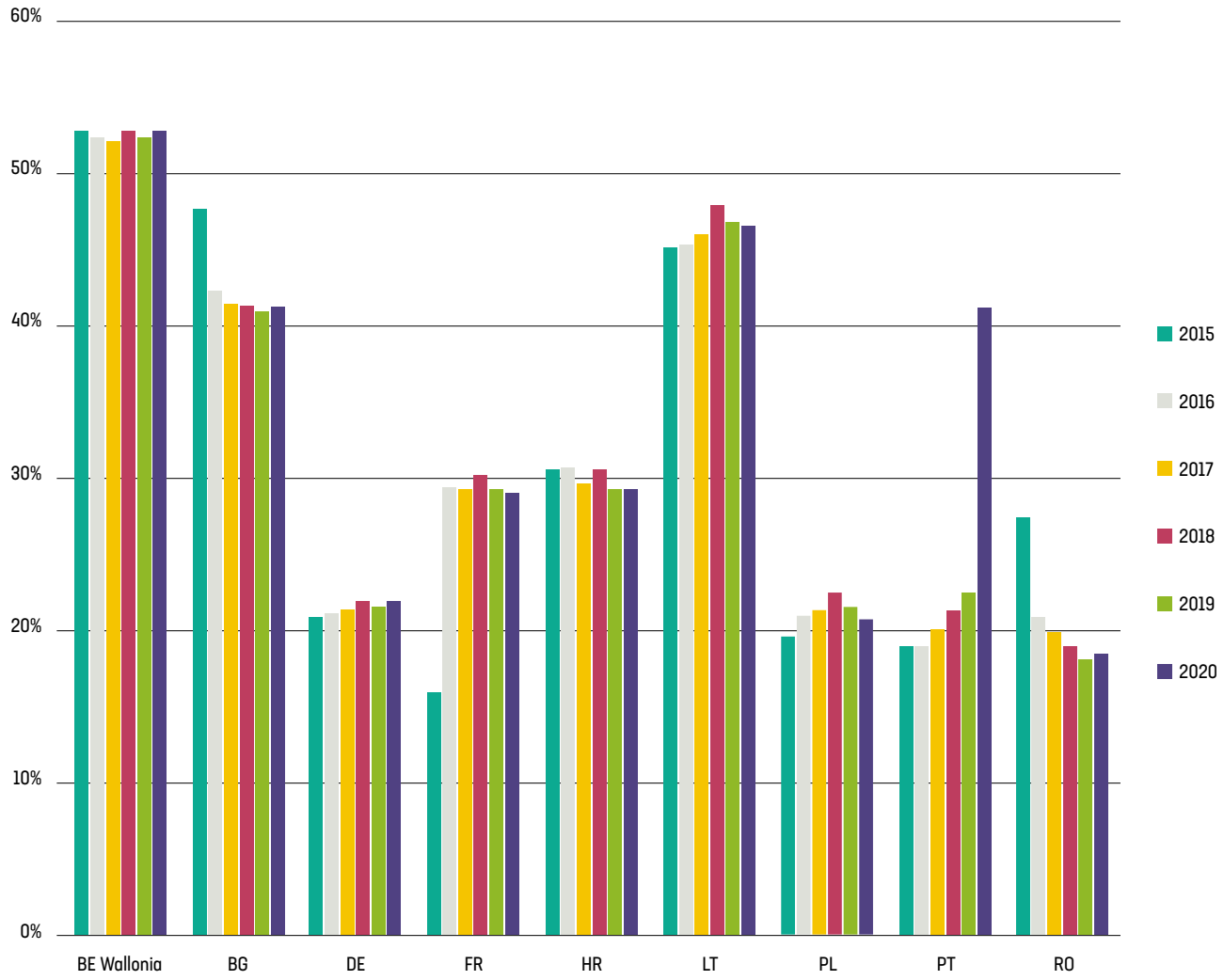
Table 5. Number of admissible applicants for direct payments and change over the 2015-2020 period at EU level

Member State	Number of admissible applicants							
	CY2015	CY2016	CY2017	CY2018	CY2019	CY2020	CY2021	2021/2015
BE	35,681	35,131	34,128	33,886	33,736	33,432	33,227	-6.9%
DK	40,797	39,531	38,638	37,918	37,338	36,673	36,046	-11.6%
DE	321,388	316,897	313,917	310,655	307,123	304,264	302,718	-5.8%
IE	126,762	124,390	129,558	128,498	127,859	127,682	127,421	0.5%
EL	685,486	646,348	619,753	611,531	610,205	615,948	621,281	-9.4%
ES	792,741	719,331	653,380	652,131	642,209	632,753	617,718	-22.1%
FR	354,441	330,591	318,962	312,426	307,710	303,533	299,828	-15.4%
HR	98,691	97,019	99,850	101,526	104,147	103,537	104,664	6.1%
IT	1,002,205	898,695	809,764	789,840	772,364	757,452	749,110	-25.3%
LU	1,824	1,780	1,756	1,730	1,713	1,696	1,682	-7.8%
MT	5,336	9,670	5,221	5,084	4,985	4,858	4,774	-10.5%
NL	45,847	45,776	44,960	44,530	43,999	43,608	43,183	-5.8%
AT	109,472	108,607	107,380	106,348	105,263	104,227	102,958	-6.0%
PT	157,928	153,172	153,602	152,891	151,894	149,772	149,439	-5.4%
SI	57,169	56,621	56,440	56,083	55,550	55,063	54,636	-4.4%
FI	52,672	51,439	50,308	49,516	48,654	47,316	46,420	-11.9%
SE	60,246	58,555	57,937	56,572	56,214	55,960	55,658	-7.6%
BPS MS total	**3,948,686**	**3,693,553**	**3,495,554**	**3,451,165**	**3,410,963**	**3,377,774**	**3,350,763**	**-15.1%**
BG	65,642	67,836	67,183	65,621	62,873	60,079	58,353	-11.1%
CZ	28,904	29,584	29,843	30,093	30,177	30,169	30,223	4.6%
EE	17,100	15,542	15,019	14,558	14,275	14,083	14,049	-17.8%
CY	33,501	33,062	32,868	32,677	32,233	32,325	31,204	-6.9%
LV	61,111	59,744	58,484	57,689	56,947	56,472	54,914	-10.1%
LT	136,221	134,069	127,470	125,322	123,316	122,591	119,116	-12.6%
HU	175,278	174,635	173,752	171,347	168,592	165,922	163,299	-6.8%
PL	1,346,848	1,344,911	1,336,349	1,317,653	1,304,524	1,292,121	1,267,814	-5.9%
RO	881,989	844,460	834,213	820,299	799,474	786,580	776,210	-12.0%
SK	18,142	18,978	18,845	18,780	18,573	18,253	18,163	0.1%
SAPS MS total	**2,764,736**	**2,722,821**	**2,694,026**	**2,654,039**	**2,610,984**	**2,578,595**	**2,533,345**	**-8.4%**
EU-27 total	**6,713,422**	**6,416,374**	**6,189,580**	**6,105,204**	**6,021,947**	**5,956,369**	**5,884,108**	**-11.3%**

Source: Member States' notifications in CATS, DG Agri (2022) [28]

[28] Summary report on the implementation of direct payments [except greening].

Figure 4. Share of the redistributive payment to farmers with holdings up to the area limit set by Member States compared to the total decoupled direct payments received by these farmers



Source: Member States' notifications in CATS, Summary Report on the implementation of direct payments [except greening]. Claim year 2020- DG AGRI (2022)

2.2.3. Evaluation framework

For assessing the effects of CAP on income level, it is recommended to consider the factors of success: "Agricultural income level in farms supported is increasing or, at least, stable due to CAP support" and "disparities between agricultural income level in farms supported, and the income level in the other economic sectors are decreasing" (see section 1.1).

The assessment of the factors of success benefits from the definition of judgement criteria, which can be assessed against indicators that provide a detailed description and allow for a careful analysis of the situation and potential changes observed throughout the programming period. The suitable PMEF indicators (see Annex I) can be made use of here. In addition, these indicators benefit from being complemented by the indicators proposed below.

Note that the framework proposed here is not mandatory for Member States, who can focus the evaluation on judgement criteria according to their needs and specific situations. Table 6 below lists three proposed judgement criteria and indicators (beyond PMEF) that may be used to analyse the extent to which the judgement criteria are being fulfilled.

The data sources to collect data for the indicators are also listed. Although Eurostat and FADN remain major sources of data for analyses on farm income carried out at the national or individual level, the administrative DME, collected at national level by the Paying Agencies, as introduced by Annex IV of Commission Implementing Regulation (EU) 2022/1475, brings valuable information on the distribution of CAP income support Interventions and the beneficiaries' features.

Table 6. Proposed judgement criteria, indicators and data sources for assessing the factors of success "Agricultural income level in farms supported is increasing or, at least, stable due to CAP support" and factors of success "Disparities between agricultural income level in farms supported, and the income level in the other economic sectors are decreasing"

Judgement criteria and indicators	Data sources
Over the examined period, the level of farmers' incomes has increased (or not) in the regions and farm typologies considered in the analysis	
Evolution of factor income per annual work unit (FI/AWU)	National statistics database
Percentage of variation of the index of agricultural factor income per AWU compared to the last three year average (***impact indicator I.3***)	Eurostat
Evolution of farm net value added per annual work unit (FNVA/AWU) by type of farming, region, and economic and physical farm size, and in areas facing natural and other specific constraints (***impact indicator I.4 and I.5***)	FADN
Over the examined period, CAP income support interventions (ISI) have contributed (or not) to enhancing the income of farmers in the regions and farm typologies considered in the analysis	
Relative share of each instrument as percentages of the overall support provided by all considered ISI by type of farming, region, and economic far and physical farm size, and in areas facing natural and other specific constraints	FADN/DME
Change in the average share of CAP support in FNVA/AWU by type of farming, region, and economic and physical farm size, and in areas facing natural and other specific constraints	FADN/DME
Change in I.3, I.4 and I.5 in a situation with and without the CAP ISI	DME/Eurostat/FADN
Over the examined period, CAP ISI have reduced (or not) disparities between agricultural income level in farms supported and the income level in the other economic sectors	
Evolution of labour costs in industry, construction and services (***sub-component of I.2***)	Eurostat
Evolution of agricultural entrepreneurial income plus compensation of employee/AWU (***sub-component of I.2***)	EEA Eurostat
Evolution of farm net income plus wages and social security charges/total AWU (***sub-component of I.2***) with and without CAP support	FADN
Evolution of farm net income minus opportunity costs for own production factors (land and capital)/ total family work units (***sub-component of I.2***) with and without CAP support	FADN
GDP/employee*	Eurostat

* GDP/employee is used here as a rough benchmark for income level in other economic sectors, although it can in some cases be a poor proxy of income level.

Source: EU CAP Network support by the European Evaluation Helpdesk for the CAP (2024)

2.2.4. Methodological approaches

The approach developed in this guidance document relies on the comparison of the income level observed when the ISI are in place (i.e. income with the support) with those of simulated income conditions in which the effect of the ISI is removed (i.e. without support). This approach allows to express a judgement on the extent of the contribution of the ISI in enhancing income level.

Simulation of the situation without support

To simulate the income level without ISI, two different hypotheses can be considered:

a) All support provided by the ISI is transferred to income i.e. ITE is equal to 1 as 100% of the support is transferred into additional income. In this case, the simulated income level without ISI should be reduced by the equivalent of amount of ISI.

b) Only a share of such support is transferred into income i.e. the ITE score would here be lower than 1 [29]. In this case, the simulated income level without ISI would be reduced by less than the amount of ISI.

More information on the ITE is provided in the box below.

Box 6. The concept of Income Transfer Efficiency

The effectiveness of ISI can be assessed using Income Transfer Efficiency (ITE). The extent to which such support affects farm income has been defined as ITE. It is the gain in farm income from the monetary value of policy support provided to farmers (Dewbre, Antón, & Thompson, 2001) [30].

This relationship between support and income considers factors like transaction costs or increases in input prices caused by the support that may decrease the income's net change stemming from the support. For example, part of the support has been found to increase the levels of land rental rates. This negatively affects the ITE in the case of farms that rely on rented land.

For example, if a policy provides EUR 100 of support to a farmer, but transaction costs associated with receiving and using this support amount to EUR 20, then the ITE of this policy would be 80% (EUR 80 out of EUR 100 are transformed into income).

Similarly, if support increases the prices of inputs (such as fertilisers or rented land) that the farmer needs to purchase, this will also reduce the ITE. This is due to different factors, including that many forms of support trigger changes in farmer behaviour, mainly concerning input use and production patterns. For instance, CAP support has been found to influence the amount of labour force employed in the agricultural sector (Olper et al., (2014) [31] and Petrick & Zier, (2011,2012) [32] and on-farm investments (Latruffe et al., (2010) [33] O'Toole & Hennessy, (2015 [34] and Sckokai & Moro, (2009) [35]). Furthermore, participating in policy measures can be costly because farmers must spend resources (e.g. time and administrative costs) to obtain support (Biagini et al., 2020) [36]. This is referred to as participation cost.

There is an existing body of peer reviewed research focused on assessing the extent of the ITE. This is done using different approaches presented in chapter 3.

Source: EU CAP Network supported by the European Evaluation Helpdesk for the CAP (2024)

[29] See chapter 3.

[30] Dewbre, J., Antón, J., & Thompton, W. (2001). The transfer efficiency and trade effects of direct payments. American Journal of Agricultural Economics, 83(5), 1204-1214. https://doi.org/10.1111/0002-9092.00268

[31] Olper, A., Curzi, D., Bedin, E., Swinnen, J. (2014). Food Security, Health and Trade Liberalization. V Società Italiana di Economia, 1-33.

[32] Petrick, M., & Zier, P. (2011). Regional employment impacts of Common Agricultural Policy measures in Eastern Germany: A difference in differences approach. Agricultural Economics, 42(2), 183-193. https://doi.org/10.1111/j.1574-0862.2010.00509.x

[33] Latruffe, L., Davidova, S., Douarin, E., & Gorton, M. (2010). Farm expansion in Lithuania after accession to the EU: The role of CAP payments in alleviating potential credit constraints. Europe - Asia Studies, 62(2), 351-365.

[34] O'Toole, C., & Hennessy, T. (2015). Do decoupled payments affect investment financing constraints? Evidence from Irish agriculture. Food Policy, 56, 67-75. https://doi.org/10.1016/j.foodpol.2015.07.004

[35] Sckokai, P., & Moro, D. (2009). Modelling the impact of the CAP Single Farm Payment on farm investment and output. European Review of Agricultural Economics, 36(3), 395-423. https://doi.org/10.1093/erae/jbp026

[36] Biagini, L., Antonioli, F., & Severini, S. (2020). The Role of the Common Agricultural Policy in Enhancing Farm Income: A Dynamic Panel Analysis Accounting for Farm Size in Italy. Journal of Agricultural Economics, 71(3), 652-675. https://doi.org/10.1111/1477-9552.12383

Previous analyses [37] demonstrate that only part of the support provided is actually converted into income. Therefore, it seems relevant to consider that the ITE is lower than one. Details on how the ITE can be estimated are provided in section 3.2 Evaluating the Income Transfer Efficiency of CAP income support interventions. A detailed description on how income indicators can be netted of the support provided by ISI under hypothesis b) is provided in section 3.3 Netting out the impact indicators with the results of the model.

Macro and micro-level analysis

The assessment of income level can be carried out at two levels: at the national level, based on EU/national data and at micro-economic level using individual farm data. The analysis at the national level allows for a judgement on farm income of the whole sector. In contrast, the analysis conducted using individual farm data can be broken down to express the relative conditions of different types of farms compared to the income condition of the whole economy. Individual farm-based data allows for analyses by sector, area and farm size.

At national level:

Statistical analyses can be used for measuring the effects of CAP support on agricultural income per labour unit. The analysis can use data from the EU regional statistics (EEA, agricultural labour input statistics) and examine the evolution of the agricultural factor income per annual work units [38]. The analysis would also build on DME that deliver information on ISI support granted to the beneficiaries according to their type of farming, region and farm size, in areas facing natural or specific constraints, etc.

Box 7. Disaggregated data on interventions and beneficiaries

According to Article 9(1) of Commission Implementing Regulation (EU) 2022/1475, disaggregated data on interventions cover all interventions of direct payments, including crop-specific payments for cotton. Annex IV of Commission Implementing Regulation (EU) 2022/1475 provides the list of data that are to be reported by Member States for monitoring and evaluation on interventions (DME). As variables are reported per agricultural financial year by unit amount, for each aid application or payment claim of each beneficiary, they provide information of interest for assessing the CAP interventions implemented (BISS, CRISS, CIS-YF, etc.).

Notably, the variables provide the full picture of CAP income support interventions implemented and how these supports are distributed among farmers over the national territory. All ISI payments are monitored (e.g. total amount of public support paid in euros for the claim), as well as specific data relating to beneficiaries and their characteristics (e.g. young farmers) or location (beneficiaries located in a given municipality, in areas with natural or specific constraints, Natura 2000, etc.). These variables can thus easily be processed by descriptive statistics to show the average amount granted under each ISI to the different types of beneficiaries.

Source: Article 9(1) of Commission Implementing Regulation (EU) 2022/1475

The factor income can be computed with and without CAP ISI to evaluate how much these payments have contributed to enhancing farmers' income. The quantitative methods to be applied for assessing the value of the impact indicator I.3 with and without the CAP are detailed in chapter 3.

In addition, the analysis of the average share of CAP support on factor income (% ISI/FI) over the examined period is useful to indicate the relative contribution of the ISI to the farm income level and whether it has evolved over time. To allow comparability over time, all considered monetary values will be deflated to express these at constant (real) prices.

[37] Relevant analyses include:
Biagini, L., Antonioli, F., & Severini, S. (2020). The Role of the Common Agricultural Policy in Enhancing Farm Income: A Dynamic Panel Analysis Accounting for Farm Size in Italy. Journal of Agricultural Economics, 71(3), 652–675. https://doi.org/10.1111/1477-9552.12383.
Ciaian, P., Kancs, d'Artis, & Paloma, S. G. Y. (2015). Income distributional effects of cap subsidies: Micro evidence from the EU. Outlook on Agriculture, 44(1), 19–28. https://doi.org/10.5367/oa.2015.0196.
Ciliberti, S., Severini, S., Ranalli, M. G., Biagini, L., & Frascarelli, A. (2022). Do direct payments efficiently support incomes of small and large farms? European Review of Agricultural Economics, 49(4), 796–831. https://doi.org/10.1093/erae/jbac013.
Dewbre, J., Antón, J., & Thompton, W. (2001). The transfer efficiency and trade effects of direct payments. American Journal of Agricultural Economics, 83(5), 1204–1214. https://doi.org/10.1111/0002-9092.00268.
Dewbre, J., & Short, C. (2002). Alternative policy instruments for agriculture support: Consequences for trade, farm income and competitiveness. Canadian Journal of Agricultural Economics/Revue Canadienne d'agroeconomie, 50(4), 443–464. https://onlinelibrary.wiley.com/doi/10.1111/j.1744-7976.2002.tb00348.x
Guyomard, H., Le Mouel, C., Gohin, A. (2004). Impacts of alternative agricultural income support schemes on multiple policy goals. European Review of Agriculture Economics, 31(2), 125–148. _____.
Minviel, J. J., & Latruffe, L. (2017). Effect of public subsidies on farm technical efficiency: A meta-analysis of empirical results. Applied Economics, 49(2), 213–226. https://doi.org/10.1080/00036846.2016.1194963.
Nilsson, P. (2017). Productivity effects of CAP investment support: Evidence from Sweden using matched panel data. Land Use Policy, 66, 172–182. https://doi.org/10.1016/j.landusepol.2017.04.043.

[38] I.3 impact indicator, https://agriculture.ec.europa.eu/common-agricultural-policy/cap-overview/cmef_en#towardsthepmef.

At micro-economic level:

This micro-level analysis uses the FNVA variable provided by the FADN database. The analysis should preferably be performed using a constant sample of farms over the period considered i.e. samples consisting of the same farms. FADN sample changes each year and only a share of the farms remains in subsequent years. Hence, to have a constant sample, it is necessary to work with a sub-sample of the farms. Note that the 'larger' is the considered period, the 'smaller' the number of the constant sample. Hence, the use of a constant sample has some disadvantages because this sample may not correctly represent the whole population.

Challenges associated with constant samples in the FADN

FADN represents the entire farm population by categorizing all farms into specific strata and assigning weights to report the observations to the population. If a farm disappears in a given year, because it is going out of business or because of a change in ownership, it is necessary to replace it with a similar farm. This is why the sample changes from year to year. The use of the balanced data set (constant sample) has two implications: it makes the representativeness characteristics of FADN lose the entire population of farms, and if done over a very long period, it tends to select very few companies, making the analysis unsound.

The main literature sources used unbalanced panel dataset. See for example: Biagini et al. (2020), Ciaian et al. (2015), Ciliberti et al. (2022), Dewbre, Antón, & Thompton (2001), Dewbre & Short (2002), Guyomard et al. (2004), Minviel & Latruffe (2017), Nilsson (2017).

Considering the same farms allows for observed changes in farm income (e.g. level, composition and stabilisation) due to changes in policy, market developments and other external factors avoiding the influence of changes in the sample over time.

Hence, the analysis at micro-level enables examinations of FNVA/AWU by type of farming, region, and economic and physical farm size, and in areas facing natural and other specific constraints [39].

It is beneficial for the analysis to also describe the relative importance of the support provided by each ISI instrument. It is suggested to describe the relative share of each instrument as percentages of the overall support provided by all considered ISI. This is because the relative shares of the different single instruments can strongly differ among regions and farm types.

Assessment of income disparities between farms and other economic sectors

To assess the effectiveness of ISI in enhancing income level, it is useful to compare the income level (with and without ISI) with a benchmark level. Previous analyses have proposed different benchmarks. The analysis can build on impact indicator I.2 [40] sub-components to compare the evolution of agricultural income (per AWU) with non-agricultural labour cost. This impact indicator compares "Labour costs in industry, construction and services (wages and salaries plus social contributions)" with three specific agricultural income indicators:

- Agricultural entrepreneurial income plus compensation of employees per annual work unit (EEA, Eurostat).
- Farm net income plus wages and social security charges by total AWU.
- Farm net income minus opportunity costs for own production factors (land and capital) by total family work units (only for farms with family labour).

However, the analysis can be undertaken only at the national level: the benchmark 'labour costs in industry, construction and services' being available only at Member State level.

Agrosynergie (2011) [41] used the gross domestic product (GDP) per employee as a benchmark. The rationale of this approach is that comparing the farm income level per unit of farm labour with such a benchmark provides an estimate of the relative income condition of the farm sector compared to the overall economy. Note that the average level of the last three available years could be used to avoid that the benchmark is influenced by peculiar conditions for a specific year. Additional indicators could also be used at the national level when the GDP is found to be a distorted benchmark in specific circumstances.

[39] In regard to I.4 and I.5 impact indicators, https://agriculture.ec.europa.eu/common-agricultural-policy/cap-overview/cmef_en#towardsthepmef

[40] For more details see: https://agriculture.ec.europa.eu/common-agricultural-policy/cap-overview/cmef_en#towardsthepmef

[41] Agrosynergie. (2011). Evaluation of income effects of direct support [Evaluation of CAP measures concerning sectors subject to past or present direct support – Lot 1: Horizontal issues]. https://op.europa.eu/s/zh79.

Box 8. Comparison of agricultural income with the gross domestic product

In order to evaluate disparities between agricultural income and income levels in the other economic sectors, the farm net value added (FNVA) can be compared to the gross domestic product (GDP). GDP at current market prices is provided by Eurostat in the regional economic accounts.

The GDP or gross domestic income (GDI) is a measure of a country/region's overall economic output. It is the market value of all final goods and services produced in a year. A unitary measure of GDP (e.g. GDP per employee) can be adopted as a benchmark, in order to overcome economic systems' size effects. As already stated, alternative indicators could also be used at the national level when GDP is found to be a distorted benchmark in specific circumstances.

Regional GDPs seem to be suitable as overall income benchmarks (i.e. income generated by all sectors of a regional economy) to be compared with farm incomes expressed in terms of value added generated by all production factors.

Sub-indicators	Geographical detail	Level of analysis	Data sources
Comparison of Factor income/AWU with GDP/ employee	Regional (NUTS II)	Macro-economic level	Eurostat/national statistics: Economic Accounts for Agriculture Labour input/costs statistics Regional statistics
Comparison of FNVA/AWU with GDP/employee	Regional (NUTS II)	Micro-economic level	FADN Eurostat/bational statistics
Comparison of FNVA/ AWU without CAP income support with GDP/employee	Regional (NUTS II)	Micro-economic level	FADN Eurostat/bational statistics

Source: EU CAP Network supported by the European Evaluation Helpdesk for the CAP (2024)

2.2.5. Interpretation of findings

Analysis at the individual farm level

The assessment of income level at the level of individual farms has two main advantages compared to the assessment of the agriculture sector at the national level. The first is that the comparison can be developed for specific groups of farms. This allows for accounting large heterogeneity of income conditions observed within the farm sector. The second is that the average values can be compared while observing the heterogeneity within each group of farms.

This latter approach allows for the development of a different way to interpret results. It states how many farms in a given group are below an income benchmark, with and without the ISI. Assume, for example, that 30% of the farms of a given group have an income level lower than the benchmark. This means that 30% of the farms are under a (relatively) difficult income condition. Now, the analysis could show that 50% of the farms are below the benchmark when the net support provided by the ISI is subtracted (i.e. assuming that not all support transfer to farm income). This suggests that the ISI support is able to reduce the share of farms under such disadvantaged conditions by 20 percentage points.

The comparison of the income conditions without the ISI can provide data to assess the role of the ISI in reducing the share of farms facing severe income conditions using the same approach just described. This can be done by considering lower levels of a benchmark to quantify the number of farms facing a severe income gap. For example, considering a benchmark level of 60% as the full benchmark, the analysis can be repeated as above to quantify how many farms are facing severe income conditions. For example, it can be assumed that of the 30% of farms having an income level lower than the benchmark, one third are also below the 60% of the full benchmark. This suggests that 10% of the farms are under severe income conditions in the current situation with income support.

These two kinds of analyses enable a judgement on the effectiveness of ISI in reducing the share of farms facing an income gap and a severe income gap.

Box 9. Farm income and household income – two different concepts to bear in mind

It is important to underline that these guidelines do not consider the possible implications of ISI on the income of farm households that is also generated by non-farm activities. Indeed, at the level of the household, farm income can be complemented with other sources of income, which can sometimes be significant (e.g. off-farm employment, social welfare, pensions, etc.). Indicators accounting for the farm employment intensity (the ratio between AWU and UAA) can be a proxy of potential other income sources in the different sectors. Data on the relative importance of farm income in the overall income of farm households (i.e. households with a farm activity) can also help reflect the significance of farm income over time in the different farm groups. Unfortunately, data on farm household income are scarce and not available in all Member States as the European Court of Auditors (2016) [42] has pointed out. Hence, it is important to bear in mind that the present guidelines only refer to the farm income component.

Source: EU CAP Network supported by the European Evaluation Helpdesk for the CAP (2024)

Influence of other factors

To interpret the differences in farm income observed over the examined period or between groups of farms, it is important to consider the influence of different external factors. Among other factors likely to influence farm income are the evolution of the structural characteristics of farms (in particular by the evolution of the average number of annual work units) and the evolution of agricultural product prices.

While theoretically important, farm structural change occurs over a long time and should be considered when comparing two points distant in time. Hence, it can be stated that structural change is probably not so important for assessing the effects of CAP ISI over the programming period.

Regarding the evolution of agricultural product prices, the analysis could consider the main groups of commodities by using two or three aggregate price indexes.

However, it must be noted that the suggested approach, which compares farm income with and without ISI, is not affected (at least directly) by structural changes and evolution of prices over time. Indeed, the analysis is based on the assumption that all other factors remain constant. This implicitly assumes that removing the ISI support does not cause significant change on the other income sources. Indeed, the price of some production factors may change if the support is removed. A typical example is land rental price, which some analyses found to be correlated to the amount of support provided to the farm sector, especially if this is coupled to production.

2.3. Effects of CAP income support interventions on income volatility in farms supported

2.3.1. Objectives and context of the analysis

The aim of this section is to provide guidance for the analysis of the effects of CAP support on farm income volatility, which is intended to be reduced compared to a situation without CAP support.

Farmers are exposed to different phenomena that are beyond their control that generate fluctuations in their income:

- Farm product markets are characterised by very inelastic demand and supply. A change in supply or demand can generate large changes in product prices, which may lead to farm income instability.
- Farmers may also find difficulties in accessing the market and, especially in the case of perishable products, face drastic reduction of revenues.
- Farmers are exposed to weather events (drought, frost, etc.), diseases and other unforeseen impacts, which can affect production, hence affecting farm income.
- Fluctuating prices of key inputs, such as energy-intensive inputs, can also strongly affect production costs and lead to a reduction of farm income.

Large variations in income may threaten farmers' viability in the long term and hinder their willingness to engage in significant investments.

ISI provides beneficiaries with a source of income that is rather stable over the years because it is not affected by the volatility of production levels and output and input prices. Hence, if the flow of revenues generated by CAP income support interventions is more stable than the revenues coming from farm sales, CAP support stabilise farm income [43]. The relative impact of ISI also depends on how large the share of ISI is in the overall income of the farm.

[42] European Court of Auditors (2016). Is the Commission's system for performance measurement in relation to farmers' incomes well designed and based on sound data? Special Report n.1.Publications Office of the European Union. Luxembourg. ISBN 978-92-872-4055-2.

[43] Farm income is then considered as relatively more stable (e.g. the percent change is lowered by taken into consideration the additional income provided by the support), although in absolute terms, the variation remains the same over the year if CAP support is perfectly stable.

Income volatility is characterised by the variance of farm income. It can be measured using indices such as Standard Deviation (SD), Coefficient of Variation (CV) and Average Percentage Changes (APC), which indicates the amount of divergences from the average income over time.

- SD is the square root of the variance. It measures how far the values lie from the mean.
- CV measures the ratio of the Standard Deviation to the mean (SD/mean). It is adequate to compare the variation between two different data set or programming periods.
- APC is based on the absolute variations calculated between income in year T and the average income of the three preceding years. It is calculated by summing the absolute relative changes and dividing by the number of considered periods. This allows comparison of values calculated on periods of different length.

For the purpose of the analysis, unitless indicators should be preferred to allow comparison among farms/regions/countries (e.g. Average Percentage Rate (APR) and CV other than SD or variance).

High volatility of income suggests the presence of substantial increases and decreases of income over a considered period. Because each volatility indicator has some pros and cons and can yield slightly different results, it is suggested to use more than one indicator. Another indicator that can be included is the 'absolute arc percentage' adopted in Loughrey et al. (2021) [44] comparing the change in agricultural income to the average of two years based on the average income from the previous two years avoiding in this the problems generated by the presence of extreme values [45].

The analysis of farm income volatility can be considered at national and individual farm levels. However, individual farm data should be preferred to national/regional data to avoid aggregation bias and allow disaggregation of results by farm groups [46]. As presented in section 2.2, at the individual farm level, the FNVA/AWU is considered the most suitable income indicator for comparing income level of different types of farms. Hence, the effects of CAP ISI on volatility will be appraised by considering the variance of FNVA/AWU.

2.3.2. Descriptive analysis

The descriptive analysis of the agricultural sector and CAP income support implemented should be first described, as indicated in section 2.2. Other elements may be useful to depict the overall context in which income volatility can be assessed, i.e. other external factors influencing farm income.

Hence, the occurrence of any specific event (e.g. extreme weather events affecting production) or the trend in input/output prices could be considered for the analysis, in order to evaluate the effects of the CAP on income volatility.

2.3.3. Evaluation framework

Although this is not mandatory, the assessment of CAP effects on income volatility contributes to addressing the factor of success recommended by the implementing regulation: "Agricultural income level in farms supported is increasing or, at least, stable due to CAP support". As it focuses on farm income variations, it can be adjusted by solely considering if "agricultural income volatility is reduced due to CAP ISI support" (see section 1.1.1).

The assessment of the factor of success benefits from the definition of judgement criteria which can be assessed against indicators that provide a detailed description and allow for a careful analysis of the situation and potential changes observed throughout the programming period. The suitable PMEF indicators (see Annex I) can be made use of here. In addition, these indicators benefit from being complemented by the indicators proposed below.

Note that the framework proposed here is not mandatory for Member States, who can decide to focus the evaluation on judgement criteria according to their needs and specific situations. Table 7 below contains one proposed judgement criteria and indicators (beyond PMEF) that may be used to analyse the extent to which the judgement criteria are being fulfilled. The data sources to collect data for the indicators are also listed.

Table 7. Proposed judgement criteria, indicators and data sources for assessing the factor of success "Agricultural income volatility is reduced due to CAP income support"

Judgement criteria and indicators	Data sources
Over the examined period, CAP income support interventions have contributed to stabilising the income of farmers in the regions and farm typologies considered in the analysis	
APC of income (FI/AWU) between income in year and the average income in the three previous years (**sub-component of I.3**)	Eurostat: EAA
Comparison of the volatility indicator index (SD, CV or APC) calculated on FNVA/AWU with and without ISI	FADN/DME
Variance and covariance of each income component including ISI support	

Source: EU CAP Network supported by the European Evaluation Helpdesk for the CAP (2024)

[44] Loughrey, J., O'Connor, D., Donnellan, T., Hennessy, T., & Thorne, F. (2021). Income volatility on Dairy Farms in Ireland. J. Stat. Soc. Inq. Soc. Ireland, 50(4), 53-78.
[45] In formula $I_{i,t}=ABS\,[(100\times((Y_{i,t}-Y_{i,t-1})/(Y_{i,t}+Y_{i,t-1})/2)]$ for each farm i with farm income $Y_{i,t}$ in year t.
[46] Severini, S., Tantari, A., & Di Tommaso, G. (2016b). Do CAP direct payments stabilise farm income? Empirical evidence from a constant sample of Italian farms. Agricultural and Food Economics, 4(1), 6. https://doi.org/10.1186/s40100-016-0050-0

2.3.4. Methodological approaches

Two main strategies are available to assess the effectiveness of ISI on reducing income volatility:

- Comparing income volatility of income with and without ISI.
- Decomposing income volatility by income sources.

The analysis can be carried out at two levels: at the macro-economic level, based on national data, and at the micro-economic level, based on individual farm data. The latter level is preferrable not only because it is not affected by aggregation bias, but also because it distinguishes among types of farming and sectors, areas and farm size.

In all cases, the volatility analysis requires a long enough time series to obtain a robust volatility assessment. Furthermore, before monetary values are affected by inflation, these should be deflated before proceeding to calculate income volatility. Finally, if a trend over time is observed, the series should be detrended. Unfortunately, how to perform detrending is an issue because different types of trends could be potentially used. It should be noted that the choice of the type of trend potentially affects the level of 'remaining' volatility. However, detrending can be considered not needed for short enough series (e.g. less than 10 years).

Note that the need for having a long enough series can strongly constrain the evaluation process if few post-reform years of data are available.

Comparing volatility of income with and without ISI

The analysis compares income variability with and without ISI. As already described, the latter can be obtained subtracting:

a) the whole ISI support; and

b) the share of the ISI support that is assumed to be transferred to income using the estimates of ITE.

The analysis consists in comparing the level of the selected volatility indicator index (SD, CV or APC) of the 'observed' income series with the 'without support' income series.

Example of findings regarding the role of direct payments to stabilise income

According to Severini et al., 2016a and 2016b, the stabilising effect of direct payments (DP) is more pronounced in farms where DP make up a significant portion of agricultural income. The variability of the income (included DP) is 29.4% lower than the variability of the income net of DP. These studies report that the share of the overall income variance of the revenues from sales is 64.5% while that of DP is only 5.3%, for the whole considered sample of farms. Furthermore, evidence from the variance decomposition, show that the revenues and DP are negatively correlated. Hence the evolution of DP contrast with that of the revenues.

Additional analysis to evaluate the robustness of the results can be developed by comparing the volatility of the two main sources of income, notably, the so-called market income (MI = FNVA – ISI) and the ISI support. However, it must be noted that this analysis could yield slightly different results than the previous one, as it does not account for the presence of possible correlation between MI and ISI support. This can however be addressed using the variance decomposition approach described below.

The income variability can be calculated at the individual farm level. Hence, to report the results for groups of farms, it is possible to use statistical indicators such as the mean or median of calculated volatility indicators. The median should be preferred because it is not influenced by outliers (i.e. very low and very high values) that are often encountered when working with individual data.

Variance decomposition by income sources [47]

The main advantage of this method is that it is suitable for accounting each income component, including the whole amount of ISI. It relies on the following income decomposition:

$$FI = REV + ISI - EC$$

Where:

- FI refers to farm income.
- REV is the amount of revenues excluding the direct policy support (ISI).
- ISI is the support provided by the sum of the different types of ISI. It could also be considered to further disaggregate the analysis considering the main ISI (i.e. $ISI_1 + ISI_2 + ...$) [48].
- EC refers to external costs that include the cost of purchased inputs (e.g. fertilisers, fuel, livestock feed etc.) and services (e.g. rented machinery services, insurance premiums etc.).

[47] This approach, which relies on farm level data, was first developed by Burt and Finley, and extensively used in policy analysis related to agricultural policies. Relevant references are:
Burt, O. R., & Finley, R. M. (1968). Statistical analysis of identities in random variables. American Journal of Agricultural Economics, 50(3), 734–744. https://econpapers.repec.org/article/oupajagec/v_3a50_3ay_3a1968_3ai_3a3_3ap_3a734-744..htm.
Kimura, S., Antón, J., & LeThi, C. (2010). Farm level analysis of risk and risk management strategies and policies: Cross country analysis. OECD. https://www.oecd-ilibrary.org/agriculture-and-food/farm-level-analysis-of-risk-and-risk-management-strategies-and-policies_5kmd6b5rl5kd-en
Severini, S., Tantari, A., & Di Tommaso, G. (2016a). The instability of farm income. Empirical evidences on aggregation bias and heterogeneity among farm groups. Bio-Based and Applied Economics, 5(1), 63–81. https://doi.org/10.13128/BAE-16367.

[48] However, it should be avoided to have a large disaggregation of ISI because in some cases some ISI components are probably often zero. It is recommended to start with the overall ISI and then, if possible, to move to a disaggregation such as: BISS and Overall other ISI components only.

The method is based on the analysis of variance and covariance of each income component as shown below. The variance of farm income (*FI*) can be expressed as suggested by Kimura et al. (2010) [49] as:

$$Var(FI) = Var(REV) + Var(ISI) + Var(EC) + 2\,Cov(REV,ISI) - 2\,Cov(REV,EC) - 2\,Cov(ISI,EC)$$

Where '*Var*' is the variance and '*Cov*' is the covariance of the terms referred to in brackets.

Dividing the right side of such expression by the sum of the first three terms (*Var(REV) + Var(ISI) + Var(EC)*) would give a standardised form for interpretation of the different components observed on the right side of the previous formula:

$$pREV + pISI + pEC + pREV;ISI - pREV,EC - pISI,EC$$

Where '*pREV*', '*pISI*' and '*pEC*' (having *Var(REV)*, *Var(ISI)* and *Var(EC)* in the nominator, respectively) are the direct effects while '*pREV;ISI*', '*pREV,EC*' and '*pISI,EC*' are the covariance effects.

The three direct effects sum to unity and an increase of the variance of anyone of these increases the variability of *FI*.

The advantage of this method is that it provides detailed information on how ISI stabilises income, while taking into account the different components influencing farm income and their correlations (e.g. between MI and ISI entries). However, its application might require some familiarity with statistics and of statistical software (e.g. STATA).

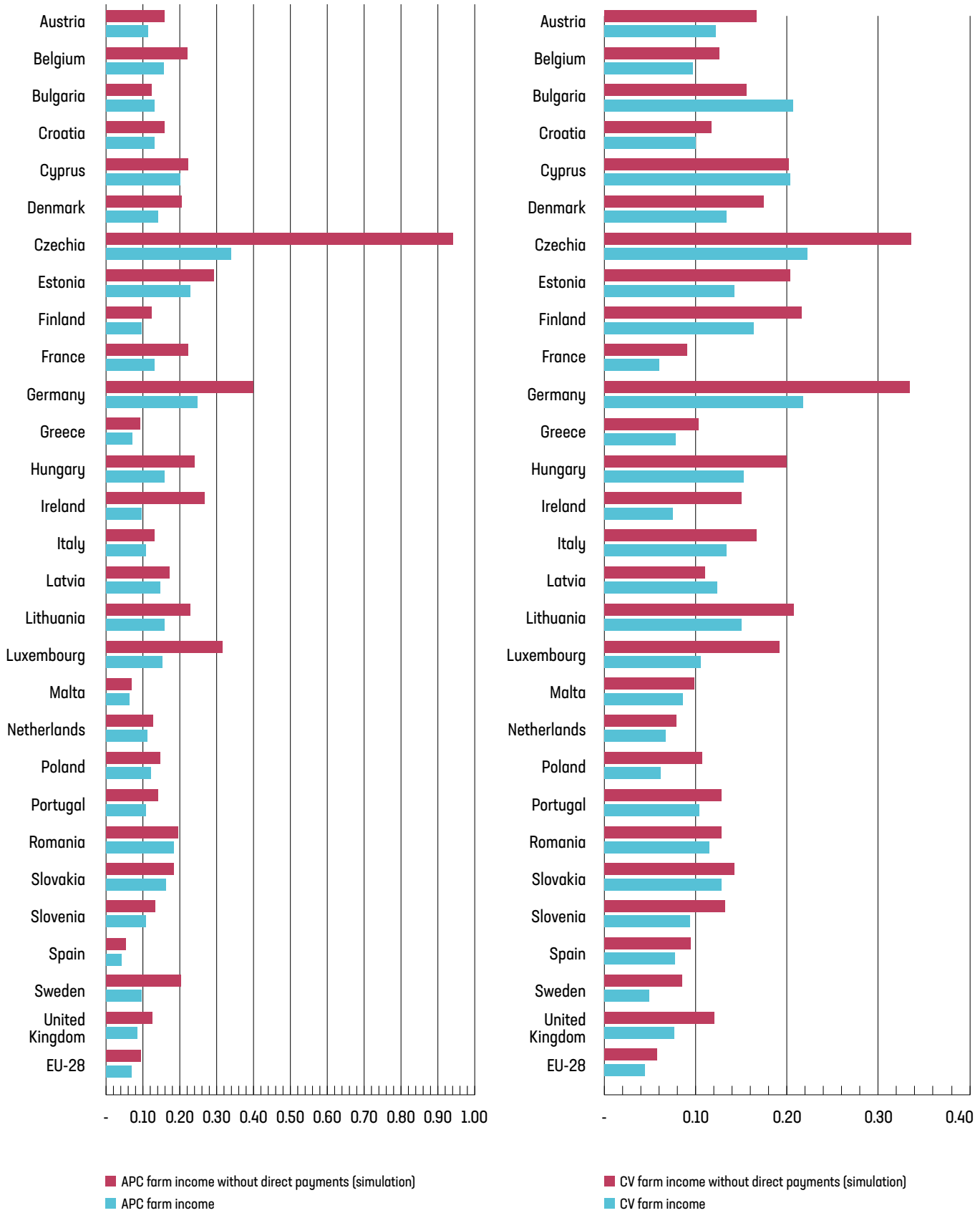
2.3.5. Interpretation of findings

Comparing income volatility of income with and without ISI support

The interpretation of the results of this method is straightforward. If the level of the selected volatility index increases when comparing the 'observed' income series with the 'without support' income series, it suggests that ISI support reduces income volatility. This way of interpreting the results applies to analyses conducted on aggregate or individual farm level data.

[49] Kimura, S., Antón, J., & LeThi, C. (2010). Farm level analysis of risk and risk management strategies and policies: Cross country analysis. OECD. https://www.oecd-ilibrary.org/agriculture-and-food/farm-level-analysis-of-risk-and-risk-management-strategies-and-policies_5kmd6b5rl5kd-en

Figure 5. Example of comparison between farm income variability indexes computed with and without direct support (average percentage changes and coefficients of variation calculated on the period 2010-15 (%))



Source: European Commission. Directorate General for Agriculture and Rural Development. & EEIG AGROSYNERGIE. (2020). Evaluation study of the impact of the CAP measures towards the general objective 'viable food production': Final report. Publications Office. https://data.europa.eu/doi/10.2762/821351

Variance decomposition by income sources

The results of the income decomposition analysis, that should be conducted on individual farm level data, are expected to provide insights on the income stabilising role of ISI.

The value of p_{ISI} (i.e. $Var(ISI)/(Var(REV) + Var(ISI) + Var(EC)$) provides an estimation of the share of direct variability due to the ISI. For example, Severini et al., (2016b) [50] have shown that in Italy direct payments accounted for 5% of the farm income variance. If this share is lower that the share of ISI in the generation of farm income, it is possible to say that the contribution of ISI to the volatility of farm income is very limited [51].

This method also explores the role of covariance between each couple of income components. A negative (positive) covariance between two components show that they move in the opposite (same) direction over time (El Benni and Finger, 2013) [52]. This allows for a reduction (increase) of the variability of FI.

For example, Severini et al., (2016b) have shown that the covariance effect between revenues and direct payments was negative suggesting that such payments played a (limited indeed) countercyclical role in comparison to fluctuations of revenues over time.

This approach can be developed in sub-sample of farms that can be grouped according to several dimensions such as: type of farming, economic size, relative level of direct support.

2.4. Effects of CAP income support interventions on income disparities in farms supported

2.4.1. Objectives and context of the analysis

The aim of this section is to provide guidance for the analysis of the effects of CAP support on reducing income disparities between farms.

Farm incomes can differ substantially between farm types, regions and sizes, and between areas with and without natural and specific constraints (e.g. pedo-climatic conditions). Therefore, the need for income support is not equal across farm sizes, agricultural sectors, and geographical areas, and since the 2013 CAP reform, increasing attention has been given to ensuring a fairer distribution of support. Different CAP instruments have been used to redistribute income support from farmers/sectors less in need to those more in need [53].

The distribution of CAP support is to a large extent driven by the concentration of agricultural land, since most direct payments are decoupled and granted per eligible hectare. This means that an overall larger share of this support is usually concentrated on a relatively small share of farms, generally of larger size. However, it should be highlighted that the level of CAP support can also differ according to labour productivity, farm specialisation, sector and size.

Data aggregated at EU level [54] show that agricultural income per AWU is generally lower in the smaller farm sizes, increasing up to a certain farm size (approximately 250-500ha) and then again decreasing. Evidence for the 2014-2020 CAP programming period shows that the amount of direct payments per hectare is generally higher in the smaller farm sizes and decreases as farm size increases. There are exceptions at the level of individual Member States showing a more homogeneous distribution of direct payments per hectare across farm size classes.

Again at EU level, FADN data show that at sectoral level (i.e. types of farming), gross farm income is generally higher in the granivores sector (pigs and poultry) and in the horticultural sector, whereas the lowest gross income levels are observed in the sheep and goat sector and mixed livestock sector. In the permanent crops sector (wine, fruit, olives) farm income frequently lags behind the national farm income average. Large farm income differences may also be observed across different farm sizes within sectors. Moreover, within sectors, the large more specialised farms generally show higher farm incomes per AWU.

2.4.2. Descriptive analysis

The description of the agricultural sector may be useful to depict the overall context in which income disparities can be assessed and the effects of CAP income support interventions on income disparities can be evaluated, by considering for instance:

- The average farm income and the farm income distribution by type of farming, region and size in ANC.
- The share of farms [55] located in Natura 2000 areas or ANC.

[50] Severini, S., Tantari, A., & Di Tommaso, G. (2016b). Do CAP direct payments stabilise farm income? Empirical evidence from a constant sample of Italian farms. Agricultural and Food Economics, 4(1), 6. https://doi.org/10.1186/s40100-016-0050-0

[51] This is the case of direct payments in the analysis by Severini et al., (2016b) where direct payments accounted for around 40% of farm income.

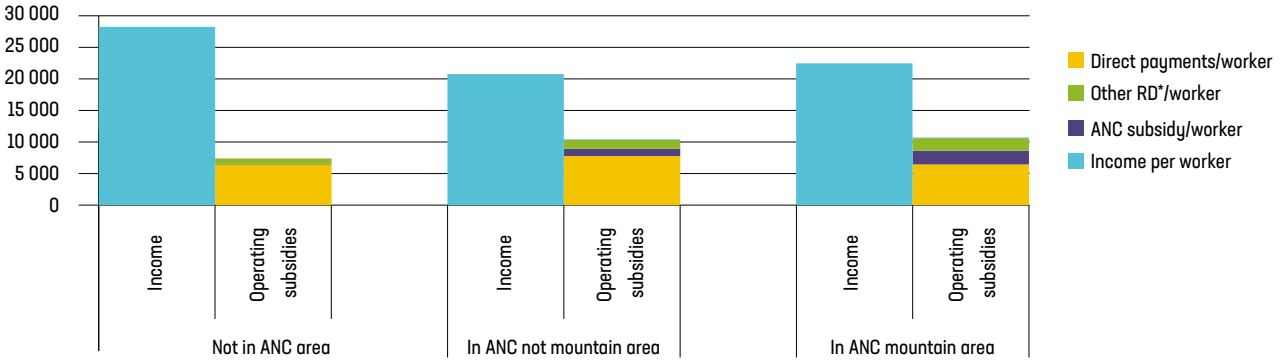
[52] El Benni, N., & Finger, R. (2013). The effect of agricultural policy reforms on income inequality in Swiss agriculture—An analysis for valley, hill and mountain regions. Journal of Policy Modelling, 35(4), 638-651. https://doi.org/10.1016/j.jpolmod.2012.03.005

[53] Although the Commission Implementing Regulation (EU) 2022/1475 includes a recommended factor of success considering if "income support is distributed to farmers most in need", it is not addressed in these guidelines that focus on the key element 'viable farm income' (see section 1.1.1). Hence, section 2.4 examines the effects on income disparities.

[54] For more details, see the European Commission's agri-food data portal: https://agridata.ec.europa.eu/extensions/DataPortal/home.html

[55] The share is here calculated by considering the geographical area of the farms, i.e. their utilised agricultural area (UAA).

Figure 6. Example of figure showing the share of operating subsidies in FNVA/AWU by ANC class at EU level (2018-2020)



Source: Based on FADN data [56], DG Agri (2023)

The implementation of CAP income support interventions might also be described as explained in section 2.2, notably the financial allocation to each CAP intervention and the equivalent unit amount delivered to beneficiaries. The CAP interventions that should be considered for the analysis are those listed by the Managing Authorities in their CAP Strategic Plan as contributing to SO1, with expected effects on PMEF impact indicators I.4 and I.5.

The redistribution of income support from larger to smaller farms is increased through the complementary redistributive income support for sustainability (CRISS), combined with other instruments such as reducing payments or capping for larger farms. Specific CAP interventions can be targeted towards specific portions of the farm population, contributing to decreasing income disparities between supported farms [57]:

- BISS through capping and reduction of the payment above a certain ceiling (Article 17), the internal convergence mechanism or by the definition of groups of territories.
- SFP, the small farmers payment replacing the financial support provided under all coupled and decoupled direct payments to farms below a certain threshold, as defined by the Member State.
- CRISS contributes to providing higher relative support to medium and smaller sized farms, by paying all active farmers a higher range of support on their first hectares.
- CIS can be delivered to sectors encountering certain difficulties, including the crop-specific payment for cotton.
- ANC/ASD interventions are supporting farms in specific areas by compensating beneficiaries for all or part of additional costs and income foregone related to the natural or other area-specific constraints.
- Complementary income support may be granted to young farmers (CIS-YF) who have newly set up for the first time and need additional income support to face this financially challenging period.

It is important to thoroughly examine how these CAP income support interventions were implemented (e.g. beneficiaries, average amount, etc.) to illustrate how they can influence income redistribution. When possible, average unit amount can be calculated for groups of farms of different type, size (UAA) or location (e.g. region, ANC, etc.). The DME also enable to distinguish the CAP payments received by the beneficiaries according to their characteristics (e.g. gender, young farmers, organic farm, etc.).

Other mechanisms should also be described as they contribute to target the support to farms with lower income. The minimum requirements for receiving direct payments can also contribute to better target income support. Better targeting can also be planned in the CSP through granting higher support rates to specific farm size/sectors under other CAP interventions (e.g. CIS, ANC, investment support, eco-schemes) and through GAEC's exemptions.

Further details are developed in following section describing the methodological and analytical approach.

2.4.3. Evaluation framework

The CAP interventions that should be considered for the analysis of the effects of CAP income support interventions on income disparities are those listed by the Managing Authorities in their CSP as contributing to SO1, with expected effects on PMEF impact indicators I.4 and I.5.

The minimum requirements for receiving direct payments can also contribute to better target income support. Better targeting can also be planned in the CSP through granting higher support rates to specific farm size/sectors under other CAP interventions (e.g. CIS, ANC, investment support, eco-schemes) and through GAEC's exemptions.

The assessment of CAP effects on income disparities contributes to address the factor of success recommended by the implementing regulation: "Agricultural income level in farms supported is increasing or, at least, is stable and disparities between farms and

[56] Overview and socio-economic and environmental features of farming in ANC areas based on FADN data, https://agriculture.ec.europa.eu/news/cap-support-crucial-maintain-farming-areas-natural-constraints-shows-latest-study-2023-07-19_en.

[57] Eco-scheme is not listed here among interventions contributing to support farm income, although some Member States have linked the eco-schemes (schemes for the climate, the environment and animal welfare) to SO1. Indeed, eco-schemes can have an impact on farm income depending on their design/targeting and the level of support granted, but their rationale differs from CAP income support interventions considered in these guidelines.

to other economic sectors are decreasing (...)" [58]. As it focuses on farm income disparities, it can be adjusted by solely considering if: "Income disparities between supported farms are decreasing due to CAP support" (see section 1.1.1).

The assessment of the factor of success requires the analysis of judgement criteria and indicators (also beyond PMEF indicators) that will provide a detailed description of the situation and potential changes observed throughout the programming period. The framework proposed in Table 8 below is not mandatory for Member States, who can decide to focus evaluations on judgement criteria according to their needs and specific situation.

Table 8. Proposed judgement criteria, indicators and data sources for assessing the factor of success "Income disparities between supported farms are decreasing due to CAP support"

Judgement criteria and indicators	Data sources
The CAP income support interventions have (have not) reduced the disparities of farm income levels over the examined period	
Changes in the Gini coefficient of farm income (FNVA) with and without CAP support	FADN
Changes in the Standard Deviation of the income levels with and without CAP support	FADN
Evolution of farm income level (compared to the average) for the beneficiaries of: CIS, CRISS, CIS-YF, ANC/ASD, etc. with and without CAP support	FADN/DME
The CAP income support interventions have (have not) reduced the disparities of farm income levels between farms from different sectors over the examined period	
Share of CAP support in FNVA/AWU by type of farming	FADN/DME
Evolution of agricultural income level by type of farming (compared to the average in agriculture) (***I.4***) with/without CAP support › Change in FNVA/AWU by type of farming with/without CAP support	FADN
The CAP income support interventions have (have not) reduced the disparities of farm income levels between farms of different sizes over the examined period	
Share of CAP support in FNVA/AWU across the FNVA quantiles	FADN/DME
Average additional payment per hectare granted to beneficiaries below average farm size, compared to the average DP per hectare granted to the entire population of beneficiaries (***R.6***)	DME
Evolution of agricultural income level by farm size (compared to the average in agriculture) (***I.4***) with/without CAP support › Change in FNVA/AWU by economic farm size with/without CAP support › Change in FNVA/AWU by physical farm size with/without CAP support	FADN
The CAP income support interventions have (have not) reduced the disparities of farm income levels between farms from different areas over the examined period	
Average additional income support per hectare granted to beneficiaries holding eligible hectares in areas with specific needs, compared to the average income support per hectare for the entire population of beneficiaries (*R.7*)	DME
Evolution of agricultural income in areas with natural constraints (compared to the average) (***I.5***) with/without CAP support › Change in FNVA/AWU by region › Change in FNVA/AWU in areas facing natural and other specific constraints	FADN

Source: EU CAP Network supported by the European Evaluation Helpdesk for the CAP (2024)

[58] Annex I of Commission Implementing Regulation (EU) 2022/1475.

2.4.4. Methodological approaches

This section describes the methodological approach that can be applied to assess farm income disparities and the effects of CAP support in this regard.

The first step describes the actual income distribution among farms of different sectors, sizes and areas and its evolution over time. It also examines the share of CAP support in total farm income for each category of farms.

The second step compares the actual situation with a simulated situation without CAP support. This entails recalculating the FNVA/AWU and other income distribution indicators (e.g. Gini coefficient) for the different groups of farms by removing from the FNVA share of support that was effectively transferred into income (also see chapter 3 Method for netting out the CAP impact on farm income indicators).

The simulated situation without CAP support can also reveal the income gaps between farms from different groups in the absence of support. The analysis can thus consider to which extent the average support granted under the different CAP interventions to the different groups can bridge the gap of income disparities (e.g. by considering if the average amount granted under ANC interventions can make up for the difference in income observed with farms located outside ANC areas).

Levels of analysis

Because the emphasis is on income distribution between farms, individual farm data (micro-level) is essential. This is because it allows for a more detailed analysis across different farm typologies according to sectors (i.e. types of farming), economic and physical farm sizes and geographical areas.

Comparative analysis can be performed using a constant sample of farms over the examined period i.e. FADN samples of the same farms in the two analysed periods. Using a constant sample allows for observations of changes in farm income due to policy and market developments, as well as other external factors avoiding the influence of change in the sample over time. As the analysis is developed by sector, economic farm size and specific areas, it requires extracting sub-samples of farms from FADN database. However, this is not always feasible, depending on the FADN database in Member States (see also the box on challenges associated with constant samples in the FADN in section 2.2).

Analysis of income distribution

The analysis of income disparities among farms requires a comparison of income levels among farms, and it should provide a measure of the distribution of income across different types of agricultural holdings.

The analysis can use simple statistical methods to evaluate the disparities in farm income level by farm type, region, size, etc. and the share of CAP payments in their farm value added.

To enable comparisons between different farm sizes, it is necessary to standardise absolute farm income values according to the amount of labour used. As already said in section 2.2, two main income indicators can be used when using FADN individual farm data, FNI/FWU and FNVA/AWU.

If the analysis focuses on the latter income indicator, it should consider how it has evolved in different farm categories over the examined programming period, looking at:

- Change in FNVA/AWU for farms of different economic sizes (e.g. FNVA quantiles);
- Change in FNVA/AWU for farms in different sectors;
- Change in FNVA/AWU for farms located in different areas (ANC, ASD or other).

The PMEF includes impact indicators I.4 and I.5 that reflect the FNVA/AWU by type of farming (TF8) [59], region, economic farm size (ES6 grouping) [60], physical farm size and in areas facing natural and other specific constraints.

The income evolution/change in CAP support by farm types can be represented in a table enabling to display a two-dimensions analysis (e.g. change in income by class of economic size (in terms of standard output) and sectors). The following tables provide examples from the evaluation study of the CAP impact on 'viable food production' (2020) [61] [62].

[59] In the FADN, TF8 is a classification of farms according to the following types: 1 = field crops, 2 = horticulture, 3 = wine, 4 = other permanent crops, 5 = milk, 6 = other grazing livestock, 7 = granivores, and 8 = mixed.

[60] ES6 Grouping in the FADN establishes six categories of farms according to their size (EUR).

[61] European Commission. Directorate General for Agriculture and Rural Development. & EEIG AGROSYNERGIE. (2020). Evaluation study of the impact of the CAP measures towards the general objective "viable food production": Final report. Publications Office. https://data.europa.eu/doi/10.2762/821351

[62] The Agrosynergie study was completed in 2018, but published in 2020.

Table 9. Absolute and relative changes in farm income (FNVA/AWU) by sector and economic size

TF		2013			2015			Absolute Changes			Relative Changes (%)		
		Total	Small	Large	Total	Small	Large	Total	Small	Large	Total	Small	Large
All TF		7.449	27.286	19.088	8.953	26.747	19.426	1.504	-539	338	20,2%	-2,0%	1,8%
Field crops	1	8.576	34.144	22.842	9.240	31.609	21.643	663	-2.525	-1.199	7,7%	-7,4%	-5,2%
Horticulture	2	7.595	21.476	19.352	11.063	24.922	22.736	3.467	3.445	3.384	45,6%	16,0%	17,5%
Wine	3	11.869	29.956	24.560	12.661	34.733	28.346	792	4.777	3.786	6,7%	15,9%	15,4%
Other perm. crops	4	11.604	22.495	16.151	15.476	22.534	18.376	3.872	40	2.226	33,4%	0,2%	13,8%
Milk	5	5.366	28.086	22.240	5.380	23.990	19.560	13	-4.096	-2.679	0,2%	-14,6%	-12,0%
Other grazing livestock	6	6.334	19.761	13.596	7.824	22.748	16.081	1.489	2.986	2.485	23,5%	15,1%	18,3%
Granivores	7	4.143	35.845	33.273	6.740	33.794	31.269	2.597	-2.051	-2.004	62,7%	-5,7%	-6,0%
Mixed	8	4.124	24.329	12.817	4.692	22.547	12.411	568	-1.781	-406	13,8%	-7,3%	-3,2%

Source: European Commission. Directorate General for Agriculture and Rural Development. & EEIG AGROSYNERGIE. (2020). Evaluation study of the impact of the CAP measures towards the general objective 'viable food production'.

The following indicator can then be computed as a result indicator of the beneficiaries' implementation choices on the FNVA/AWU. It considers the amount received from relevant CAP interventions aiming at compensating for specific disadvantages and how it contributes to the FNVA across groups of farms of different economic sizes (FNVA quantiles):

› Share of CAP support in FNVA/AWU over the examined period across sectors (TF) and FNVA quantiles (FADN).

Table 10. Share of CAP and DP support on income in EU farms, by sector and economic size (2013-2015)

TF8		2013			2015			Absolute changes (dif. % points)		
		Small	Large	Total	Small	Large	Total	Small	Large	Total
Overall CAP support (CAP/FNVA)										
All TF		51.5%	37.6%	39.8%	43.8%	37.3%	38.5%	-7.7	-0.3	-1.3
Field crops	1	64.4%	46.8%	49.7%	58.8%	47.1%	49.3%	-5.6	0.3	-0.4
Horticulture	2	7.1%	4.1%	4.3%	9.3%	2.7%	3.2%	2.2	-1.3	-1.0
Wine	3	14.3%	5.8%	7.0%	18.6%	5.1%	6.8%	4.4	-0.7	-0.2
Other permanent crops	4	33.7%	19.1%	25.2%	23.6%	18.7%	21.1%	-10.1	-0.4	-4.1
Milk	5	45.2%	36.2%	36.8%	55.0%	43.8%	44.5%	9.8	7.6	7.7
Other grazing livestock	6	75.3%	77.6%	77.1%	65.3%	68.8%	68.1%	-10.0	-8.8	-9.1
Granivores	7	32.0%	16.6%	16.7%	23.3%	17.2%	17.4%	-8.7	0.6	0.6
Mixed	8	62.7%	52.4%	54.3%	55.1%	54.4%	54.6%	-7.5	2.0	0.2
DP support (DP/FNVA)										
All TF		39.4%	30.7%	32.1%	35.5%	30.8%	31.7%	-3.9	0.1	-0.4
Field crops	1	52.5%	41.3%	43.2%	51.6%	42.2%	44.0%	-1.0	0.9	0.8
Horticulture	2	3.7%	3.6%	3.6%	6.5%	2.2%	2.6%	2.8	-1.4	-1.0
Wine	3	10.6%	4.4%	5.3%	14.6%	3.6%	5.0%	4.0	-0.8	-0.3
Other permanent crops	4	28.3%	15.7%	21.0%	19.4%	15.3%	17.3%	-9.0	-0.4	-3.7
Milk	5	30.8%	27.7%	27.9%	41.3%	35.2%	35.6%	10.6	7.4	7.7
Other grazing livestock	6	48.6%	57.4%	55.5%	45.1%	50.4%	49.3%	-3.5	-7.0	-6.3
Granivores	7	25.9%	13.4%	13.5%	20.3%	13.4%	13.5%	-5.6	0.0	0.0
Mixed	8	47.2%	43.7%	44.4%	45.9%	46.7%	46.5%	-1.2	2.9	2.1

Source: European Commission. Directorate General for Agriculture and Rural Development. & EEIG AGROSYNERGIE. (2020). Evaluation study of the impact of the CAP measures towards the general objective 'viable food production'.

Indicators of income disparities

Two main statistical indicators can be used to quantify income disparities:

- Gini coefficients.
- Standard Deviations of farm income.

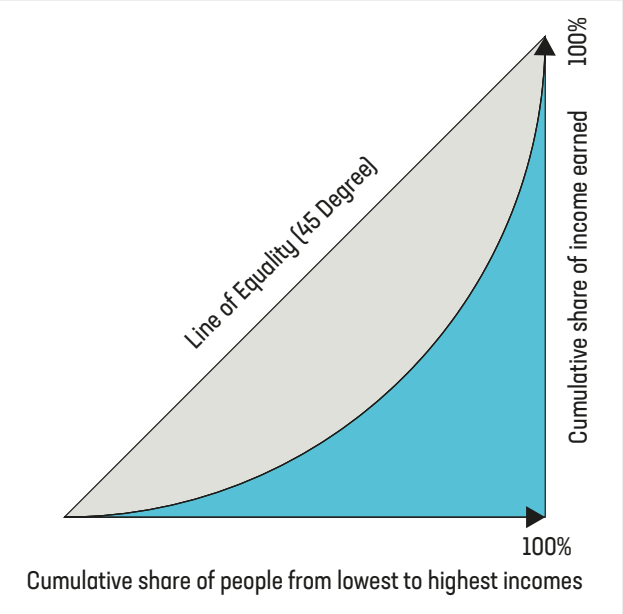
Gini coefficient

The Gini coefficient measures disparities in income level in the farm population by assessing how much the overall generated income is concentrated within the farm population (see below, Box 10).

The Gini coefficient is used to measure the degree of statistical dispersion of variables transferrable between different units of the same population (i.e. income in our case). Therefore, this statistical approach allows for the assessment of the level of equity in farmers' income distribution. The Gini coefficient ranges from 0 (perfect equity, all farms enjoy the same level of income) to 1 (complete inequity, only one farm enjoy the whole amount of farm income).

The Gini coefficient can be computed for different years throughout the examined period. Even more interesting, the Gini coefficient can be used to compare the actual situation with a simulated situation without CAP income support.

Box 10. Gini concentration



The Gini coefficient is a measure of statistical dispersion intended to represent the income or wealth distribution of a population and is the most commonly used measure of inequality. The Gini coefficient is usually defined mathematically based on the Lorenz curve, which plots the proportion of the total income of the population (y axis) that is cumulatively earned by the bottom x% of the population (see diagram). The line at 45 degrees thus represents perfect equality of incomes. The Gini coefficient can then be thought of as the ratio of the area that lies between the line of equality and the Lorenz curve (marked A in the diagram) over the total area under the line of equality (marked A and B in the diagram); i.e. G = A / (A + B). It is also equal to 2A and to 1 – 2B due to the fact that A + B = 0.5 (since the axes scale from 0 to 1).

Source: Evaluation study of the impact of the CAP measures towards the General Objective 'viable food production', Agrosynergie (2020)

The comparison of the Gini coefficient level with and without the ISI support allows to assess how effective (or ineffective) is the ISI support in reducing the income concentration that is income disparities. The calculation of the Gini coefficient needs here to consider the simulated situation of farm income 'without policy', as explained in section 2.1.

Standard Deviation

The disparities in income level among farms can also be calculated using the Standard Deviation (SD), which measures the distribution of the observed values around the mean. In order to assess the changes in income level disparities among farms, changes in the SD of the income levels can be computed for various years throughout the examined period. The higher the SD, the more disparities around the average income level.

To reflect the CAP effects on income disparities, the SD of the income level can be calculated in the actual situation and in a simulated situation without CAP income support.

The SD is most useful when the income variable has a normal distribution. However, this is generally not the case (i.e. the average is often not at the centre of the distribution because of outliers and income levels skewed to the right or the left). This can happen when there are many more very high income levels than there are very low income levels, or vice versa. One option is to work with the logarithm of income. The logarithmic transformation reduces large changes or differences in the data and lowers the impact of outliers [63] [64].

Note that the logarithmic transformation rules out the possibility of accounting for negative income levels. Hence, it might be inadequate when the simulated income series without the support provided by ISI is considered.

Another issue in using the SD is that this measure is very sensitive to very small average income levels [65]. Since it represents the typical deviation from the average income, an abnormally low average income will make a normal income level stand out.

[63] Sun, K., Henderson, D. J., & Kumbhakar, S. C. (2011). Biases in approximating log production. Journal of Applied Econometrics, 26(4), 708–714. https://doi.org/10.1002/jae.1229

[64] Mullahy, J., & Norton, E. (2022). Why Transform Y? A Critical Assessment of Dependent-Variable Transformations in Regression Models for Skewed and Sometimes-Zero Outcomes. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4299621

[65] Leys, C., Ley, C., Klein, O., Bernard, P., & Licata, L. (2013). Detecting outliers: Do not use standard deviation around the mean, use absolute deviation around the median. Journal of Experimental Social Psychology, 49(4), 764–766. https://doi.org/10.1016/j.jesp.2013.03.013

PMEF result indicators

The PMEF provides two additional result indicators that can be used for the assessment of CAP effects on farm income disparities, which compare the average direct payments per hectare received by beneficiaries below the average farm size/in areas with higher needs compared to the average direct payments received by the whole farm population:

- Percentage of additional direct payments per hectare for eligible farms below average farm size (compared to average) (R.6).
- Percentage of additional support per hectare in areas with higher needs (compared to average) (R.7).

When using these indicators and relative set targets, some care should be taken in their interpretation. The computation of R.6 includes all DP interventions (i.e. BISS, CRISS, CIS-YF, eco-schemes, CIS) except the cotton payment and the computation of R.7 includes all DP interventions except the cotton payment (i.e. BISS, CRISS, CIS-YF, eco-schemes, CIS) and ANC and ASD payments. However, flexibility was given to Member States for linking individual interventions to result indicators in their intervention logic. Therefore, R.6 and R.7 should be interpreted within the context in which their targets were established in relation to the links that were made in the CSP with specific contributing interventions. It also should be borne in mind that R.6 and R.7 can provide information about the combined effect of the linked CAP interventions, but not about the effect of single interventions.

It should also be avoided to draw conclusions as to the effectiveness of CAP interventions for income redistribution based on these result indicators alone.

2.4.5. Interpretation of findings

Understanding the income disparities observed by farm typologies

Although the analysis of FNVA by farm typologies reveals the extent of income disparities among farms in a given territory, it does not allow for disentangling the effects of the different dimensions on income level. Indeed, dimensions such as region, specific areas (ANC, Natura 2000, WFD), type of farming, farm size (by SO and/or UAA), extensive/intensive farming, etc. are all very much correlated. For example, in mountain areas, farms may be smaller than in other areas, whereas some farm types are represented more among small than large farms.

Interpreting the importance of CAP income support across sectors, farm sizes, etc.

The analysis conducted on data broken down by sector and class of economic size shows relative importance of CAP support across farms with different characteristics. However, it should be noted that changes observed in the share of CAP support can be explained both by a change in CAP support or a change in the FNVA of farms from specific sectors, strongly influenced by the evolution of prices observed over the considered period.

Assessing the effects of targeting CAP support

The analysis of changes in the relative importance of CAP support for the different farm types in the considered period will provide elements to judge about the CSP's capacity to reduce income disparities by distributing support in favour of farms with lower income.

For instance, the analysis can reveal an increase in the level of direct payments in small farms, compared to large farms, confirming that CAP income support increasingly targets support towards smaller size farms (even if the income gap between small and large farms remains considerable).

Hence, the targeting strategy (comparison of the level of support granted to two different farm typologies) must be compared to the evolution of income between the two farm typologies in order to see how the income gap has evolved (although this says nothing about the role of the CAP as other factors have a strong influence on farm income).

Nevertheless, the CAP's contribution can be demonstrated by assessing how the gap would have evolved in a simulated situation without CAP support.

Assessing the effects of the capping/degressivity mechanisms

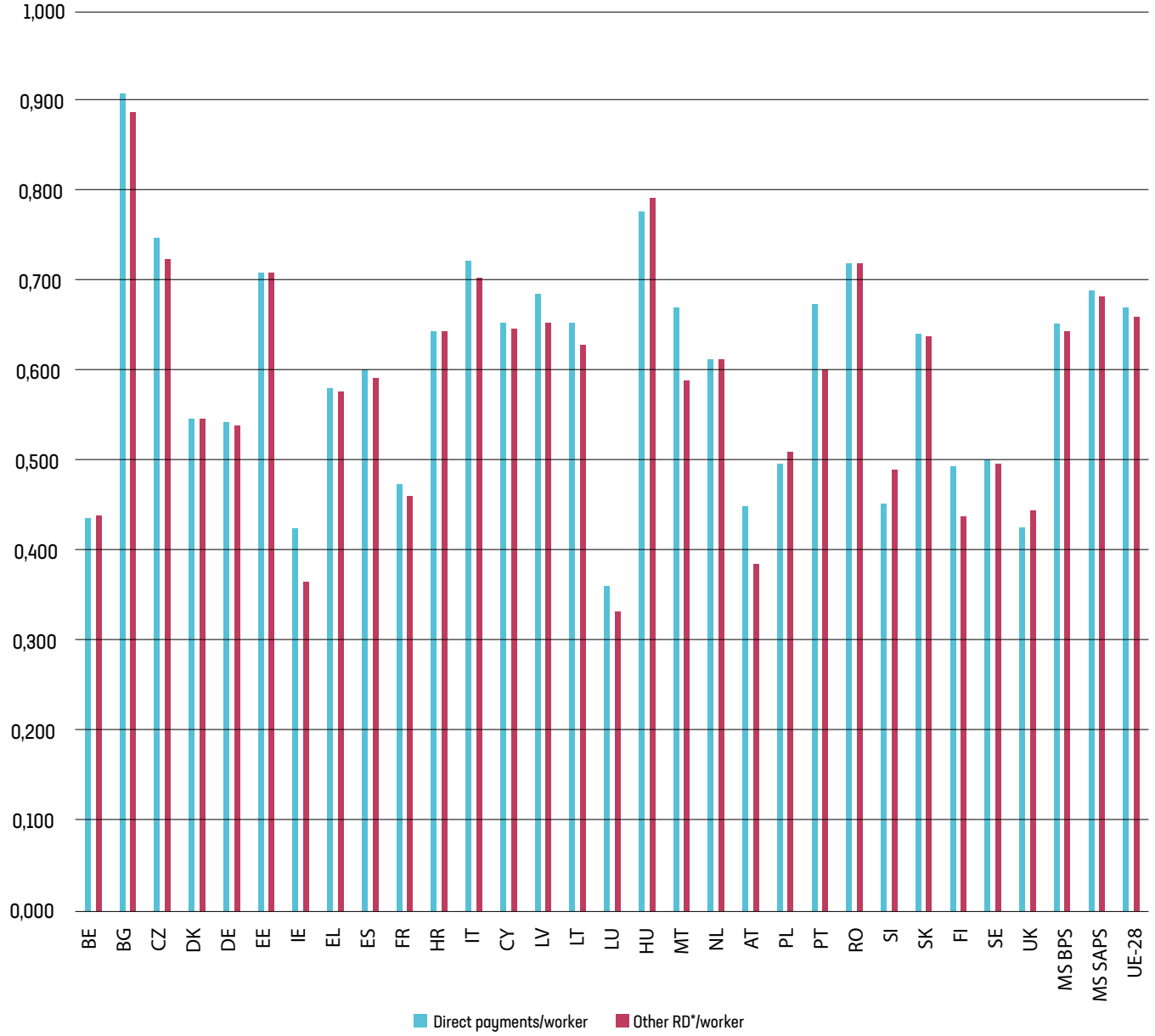
Member States have implemented different strategies regarding the reduction of CAP payments (degressivity/capping mechanisms).

These effects can be approached by considering the distribution of CAP direct support, having recourse to the concept of concentration and Gini coefficient (it ranges from 0 (perfect equity) to 1 (complete inequity). The Gini coefficient accounts here for the distribution of the absolute amount of support among farms.

An example from the evaluation study of the CAP impact on 'viable food production' [66] is provided in Figure 7.

[66] European Commission. Directorate General for Agriculture and Rural Development. & EEIG AGROSYNERGIE. (2020). Evaluation study of the impact of the CAP measures towards the general objective "viable food production": Final report. Publications Office. https://data.europa.eu/doi/10.2762/821351

Figure 7. Gini coefficients on direct payment support concentration, 2013 and 2015



Source: Elaborations based on sample data EU-FADN-DG AGRI C-3, European Commission, Directorate General for Agriculture and Rural Development & EEIG AGROSYNERGIE (2020), Evaluation study of the impact of the CAP measures towards the general objective 'viable food production'.

The analysis carried out for the evaluation study showed that in most countries, income support concentration decreased and this reduction was significant (i.e. greater than 5%) in Ireland, Luxembourg, Malta, Austria, Portugal and Finland. However, the relation between the mechanism of reduction of payments and the changes in support concentration is not always clear: for instance, a good reduction in the support concentration was also found in Finland and Malta, although these countries did not adopt the capping in 2015.

A similar approach can be developed to assess the effectiveness of the CRISS. This can be done by calculating SD and Gini coefficients on the original income series with those calculated on the income series net of the support provided by the CRISS.

The comparison of results of SD and Gini concentration levels with and without the overall ISI support allows to assess how effective ISI are in reducing income disparities.

For example, if the SD of the income indicators with ISI support (e.g. FNVA/AWU) is 0.8 while the SD calculated on the income indicator net of ISI support is 1.2, it is possible to state that ISI allows to reduce income disparity by 33%.

Similar considerations apply to the Gini coefficient analysis. For example, if the Gini coefficient level calculated on the incomes with ISI is 0.4 while the Gini coefficient calculated on the income series without ISI support is 0.8, it is possible to conclude that ISI reduce income concentration by 50%.

2.5. Efficiency of CAP income support interventions

This chapter offers methods for the assessment of the efficiency of CAP income support interventions. It outlines the definition of 'efficiency' as well as its relationship with the 'effectiveness' of CSP interventions. Approaches and relative challenges to evaluate the efficiency of CAP ISI are presented and discussed. Two concepts are developed that can be used to evaluate the efficiency of different interventions: cost-effectiveness and Income Transfer Efficiency. Furthermore, suggestions are made on how to collect data and prepare the analysis.

2.5.1. Efficiency in the context of CAP Strategic Plans evaluations

As stated in section 2.1, the efficiency of a policy refers to its ability to produce the intended result while using the fewest resources possible.

The Commission Implementing Regulation (EU) 2022/1475 defines in Article 1 that "Member States shall analyse whether the effects or benefits of the CAP Strategic Plans were achieved at a reasonable cost". The term 'reasonable' is not defined in the regulation, which could open the door to arbitrary assessments.

The guidelines recommend two different and complementary approaches to compare the effects achieved by CAP ISI with the costs engaged for their implementation, and thus provide an assessment of their efficiency: the cost-effectiveness and the Income Transfer Efficiency analyses. As explained below in more detail the 'cost-effectiveness' framework is an adequate approach to assess whether interventions are 'efficient'.

Concept of cost-effectiveness

The Better Regulation Toolbox' [67] associates the concept of cost-effectiveness to the assessment of efficiency in the definition of 'evaluation' provided in Box 1 of Tool 45:

"Evaluation is an evidence-based judgement of the extent to which an existing intervention is:

- effective in fulfilling expectations and meeting its objectives;
- efficient in terms of cost-effectiveness and proportionality of actual costs to benefits."

What 'cost-effectiveness' means is not defined in the Better Regulation Toolbox [68], but it is well defined in economic textbooks on cost-benefit analyses [69].

Cost-effectiveness is a mathematical expression where effects are in the numerator and costs are in the denominator. Depending on what dimensions are used, cost-effectiveness can be expressed in monetary values (e.g. 1 € of Farm Net Value Added per AWU was attained with costs of 0.25 €) or in relations of physical units (e.g. reduction of 25 mg NO_3 emission into groundwater was attained by applying 25 kg less N fertiliser per hectare in the nitrate vulnerable zone). In the context of assessing CAP ISI, the denominator is expressed in monetary terms, whereby costs can be defined in several ways (see section 2.5.3).

Cost-effectiveness, as a statement on the relation of costs and effects, can allow comparing different interventions and rank them, e.g. y is more cost-effective than z.

Cost-effectiveness hinges on two figures:

- an indicator of effectiveness, as defined in the previous chapter (effects on the level, the volatility, and the distribution of income);
- and an indicator on the costs.

Costs in the context of the evaluation studies have not yet been defined. According to the better regulation initiative:

"the full efforts to support and perform an intervention can be broken into different categories such as **adjustment** costs, **administrative** costs, **fixed** costs, **running** costs".

In the next paragraphs, each of these cost-terms will be explained. Transfers to beneficiaries, that are part of running costs of an intervention, are also defined. Summing these costs together gives the 'total costs' that are put into the denominator of the cost-effectiveness formula.

Transfers to beneficiaries

Such transfers are payments paid to farmers or other recipients specific to the interventions of interest. They include not only the EU financed part of payments but also national and subnational contributions. They are one element of the running costs of the programme.

Adjustment costs

They occur when new procedures are introduced. As an example, the CIS-YF may require young farmers to get trained and develop a business plan to benefit from the support. Each of these adjustment steps is associated with direct costs or opportunity costs which should be added together. Some of them can be viewed as the investment that is necessary to participate in a new scheme (e.g. training). Their total amount should be spread over the programme period.

Administrative costs of beneficiaries and administration

According to the better regulation guidelines, administrative costs are: "costs for companies to comply with new administrative obligations" [70].

[67] For more details, see https://commission.europa.eu/law/law-making-process/planning-and-proposing-law/better-regulation/better-regulation-guidelines-and-toolbox/better-regulation-toolbox_en

[68] The term 'cost-effectiveness' is mentioned two times in the Better Regulation Toolbox (2023 version) but not defined there.

[69] Pearce et al., (2006) Cost-benefit analysis and the environment: Recent developments. Organisation for Economic Co-operation and Development, provide a definition of cost-effectiveness in chapter 18.10 of their book and explain the advantages and shortcomings of this measure in decision making.

[70] European Commission, 2023, Better Regulation Toolbox, Brussels, page 210.

Administrative costs of beneficiaries and non-beneficiaries (those who submitted a project but failed) are relevant costs. However, these costs are not well known in most cases and generally not monitored.

Not only beneficiaries incur administrative costs. Organisations that design, implement and administer the interventions also face costs. These costs are also part of the total costs associated with a given intervention. In order to assess the administrative costs, the Better Regulation Toolbox recommends using the standard cost approach (see section 2.5.3).

Fixed and running costs

The implementation of CAP intervention can require some investments for their administration and monitoring (e.g. if application switches from paper to digital means, an electronic device is necessary – these are fixed costs). Monthly or yearly expenditures (e.g. for access to the internet) are running costs. It is advisable to differentiate between fixed and running costs and to spread fixed costs over the programme period (e.g. five years).

Concept of Income Transfer Efficiency

Aside from the cost-effectiveness analysis that requires monitoring the different costs associated with the implementation of the support, the efficiency of CAP income support interventions can also be measured by considering the increase of income due to an additional euro spent on ISI.

As described in Box 6 in section 2.2, the Income Transfer Efficiency considers the share of the income support intervention that is effectively transferred into farm income. It assumes that opportunity [71] and transaction costs or distributive leakages [72] may cause a decrease in the income's net change stemming from the support. Hence, it adequately reflects the additional effects achieved with the allocated budget.

2.5.2. Evaluation framework for assessing the efficiency

The CAP Strategic Plan Regulation does not specify any factor of success for the assessment of efficiency. In this respect, the evaluation framework intends to assess the general efficiency of CAP income support instruments. It replies to the general evaluation question: "To what extent were the benefit/impacts on farm income level, volatility and distribution achieved with the lowest expense?".

The reply to this evaluation question benefits from the definition of judgement criteria which can be assessed against indicators that provide a detailed description and allow for a careful analysis of the situation and potential changes observed throughout the programming period.

Note that the framework proposed is not mandatory for Member States, who can decide to focus the evaluation on judgement criteria according to their needs and specific situations. Table 11 below lists two proposed judgement criteria and indicators that may be used to analyse the extent to which the judgement criteria are being fulfilled. It builds on result from the effectiveness analyse and use as indicators the findings from the analyses carried out to demonstrate the net effects of the CAP.

Table 11. Proposed judgement criteria, indicators and data sources for assessing the efficiency of income support interventions and reply to the evaluation question: "To what extent were the benefit/impacts on farm income achieved with the lowest expense?"

Judgement criteria and indicators	Data sources
Cost-effectiveness: To what extent were the benefit/impacts achieved with the lowest expense?	
CAP net effects on different impact indicators (I.2, I.3, I.4 and I.5)	Findings from effectiveness analyses based on Eurostat and FADN
CAP ISI net effect on change in net value added per AWU	
CAP ISI net effect on change in coefficient of variation of income	
CAP ISI net effect on change in the Gini coefficient	
Total costs associated with the implementation of ISI	DME/survey
Income Transfer Efficiency: To what extent were income support interventions effectively transferred into farm income?	
ITE of ISI	FADN

Source: EU CAP Network supported by the European Evaluation Helpdesk for the CAP (2024)

[71] Opportunity costs happen when farmers, in order to receive the payments, choose to forgo a more or less important part of their income.

[72] This refers to the case in which a part of the economic benefit of a payment goes to subjects who may not be the intended beneficiaries of the policy. Indeed, some of the support provided by direct payments 'leak' through to non-farm owners of resources. This is particularly true if payments cause a growing demand for farm inputs (e.g. land), which in turn, results in an increase of the price of those inputs.

2.5.3. Methodological approaches

The methods provided here refer to the two judgement criteria of the evaluation framework above and consist of assessing the cost-effectiveness first and then the Income Transfer Efficiency of CAP income support interventions.

How to calculate the cost-effectiveness

The analysis of cost-effectiveness is quite straightforward and consists of a two-step approach:

1. The first task is to identify the costs associated with the implementation of CAP income support interventions:

- payments to recipients (EU, national, subnational contributions);
- adjustment costs (fixed and running) of beneficiaries and non-beneficiaries;
- adjustment costs (fixed and running) of administration;
- administration costs (fixed and running) of beneficiaries and non-beneficiaries;
- administration costs (fixed and running) of administration.

The sum of all these items is the 'total costs' which are used to calculate the cost-effectiveness of CSP interventions. They can be calculated per year or as a total of all costs over the programme period.

It is important to be aware that some elements of these costs may have been used to calculate the net effect of CAP income support interventions (e.g. on income level) to avoid overestimating the effect. In such a case, the relevant cost-element(s) should not be added to the costs (in the denominator). It is advisable to make it explicit which cost-element(s) were excluded because they were accounted for in calculating the net-effect. An example is provided in Box 11 below.

Box 11. Example on how to calculate cost-effectiveness ratio and transfer efficiency

The example below shows the cost and benefit positions in a realistic but simple situation.

The paying agency transfers 100 € per ha to the farmer – position (1). The administrative costs are 10 € per ha. In total the costs of the paying agency are 110 € per ha.

The farmer receives 100 € per ha from the paying agency. The farmer has administrative costs of 5 € per ha and adjustment costs of 20 € per ha. The income for the farmer obtained by the transfer is 75 € per ha. The transfer efficiency is 75%.

Paying agency	Cost per ha	Transfer	100 €	(1)
		Administrative costs	10 €	(2)
Farmer	Transfer per ha	Administrative costs	5 €	(3)
		Adjustment costs	20 €	(4)
		Income support impact	75 €	(5) = (1) – (3) – (4)
Transfer efficiency		75%		(6) = (5) / (1)
Cost-effectiveness variant 1		0.68		(7) = (5) / [(1) + (2)]
Cost-effectiveness variant 2		0.56		(8) = (5) / [(1) + (2) + (3) + (4)]

Source: EU CAP Network supported by the European Evaluation Helpdesk for the CAP (2024)

Cost-effectiveness ratios can be calculated in more than one way:

- Recommended: Cost-effectiveness variant 1: Only the expenditures and costs of the paying agency (110 €) are used in the denominator. The income of 75 € per ha is in the numerator. In that case, the cost-effectiveness-ratio is 0.68 (= 75/110).
- Not recommended: Cost-effectiveness variant 2: The cost of the farmer (administrative costs and adjustment costs, in total 25 €) are added to the expenditures and costs of the paying agency (110 €) and this sum is used in the denominator (135 €). In the numerator is 75, the income of the farmer. In that case, the cost-effectiveness ratio is 0.56 (= 75/ 135).

It is recommended to view cost-effectiveness from the perspective of the paying agency: All costs associated with the transfer to the farmer. These costs are the denominator. Income after considering the costs incurred by the farmer is the amount used to calculate transfer efficiency which is in the numerator.

It is advisable to clearly identify all the elements of total costs so that it is possible to calculate variant 1 and variant 2 if necessary. Depending on the context of the analysis, variant 2 may be the appropriate way to calculate the cost-effectiveness ratios. To avoid any confusion, transparency is very important.

Method to collect information on administrative costs

When efficiency is evaluated, these administrative costs need to be considered.

Attaining these costs is not easy because records do not exist in most cases. It is important to include those who received payments, those who applied but failed to become a beneficiary and those who considered applying for a programme but eventually decided not to. To include these costs is important because the effects of an intervention should be put in relation to the total costs. If an intervention is designed or implemented in a very burdensome manner for potential recipients, a limited uptake may be explained by looking at the total adjustment and administrative costs.

Therefore, it may be necessary to conduct a detailed survey to attain information of those who are addressed by the programme. If the survey is already included in the application process, things are relatively straightforward. If not, the collection of cost data will be more costly. Special attention should be given to beneficiaries, but when the uptake of CAP interventions is low it is important to also consider non-beneficiaries. Indeed, high administrative costs may lead to low adoption rates.

A recent study from Switzerland (El Benni et al., 2022) [73] provides guidance on how to obtain estimates on the administrative burden of direct payments and gives some indications on their costs relative to the premiums. When similar surveys are conducted, they should not only cover direct payments but all interventions that are relevant for a potential beneficiary. The results obtained for interventions that are not focused on income (i.e. level, volatility, fairness) should be used for the assessment of the efficiency for the other interventions. Another study analyses and assesses different elements of the Integrated Administration and Control System (IACS), including the Land Parcel Identification System (LPIS) and related control mechanisms in place across the EU [74].

Box 12. How can non-beneficiaries be included in an analysis?

There are at least two ways to get information from non-beneficiaries. A precondition is that the group of all potential beneficiaries is known. Adequate eligibility criteria will be the starting point, e.g. all farms, all enterprises in region X, persons not older than 40 years, etc. The 'eligibility criteria' define the basic population and those who are not eligible at all. The 'selection criteria' are used to differentiate between potential and actual beneficiaries. The two variants to obtain information on non-beneficiaries are:

a) Collect information on those persons/enterprises that submitted an application for support/a project but were not eligible or were not ranked to become a beneficiary.

b) Collect a random sample of potential beneficiaries among the population passing the eligibility criteria. This sample will include beneficiaries, non-beneficiaries that applied but were not selected and non-beneficiaries that did not apply for support.

Depending on how the application is administered, it may be straightforward to collect relevant information from non-beneficiaries that applied for support. When an application process is designed, it is therefore important to have in mind to collect information on characteristics of non-beneficiaries. Getting information from those who did not apply is trickier. To get feed-back from them, it will be necessary to identify them (based on eligibility criteria) and to motivate them to take part in a survey. A motivation can be that the authority in charge of the programme commits to work on reducing the administrative burden.

In the context of income support interventions which are the topic of this guidance, the costs of non-beneficiaries are likely not relevant. Whether they are relevant or not depends on the way interventions are implemented.

Source: EU CAP Network supported by the European Evaluation Helpdesk for the CAP (2024)

[73] El Benni, N., Ritzel, C., Heitkämper, K., & Mack, G. (2022). Der administrative Aufwand Schweizer Landwirtschaftsbetriebe durch das Direktzahlungssystem. *Agrarwirtschaft Schweiz*, 67–76. https://doi.org/10.34776/AFS13-67

[74] Directorate-General for Agriculture and Rural Development (European Commission), & ECORYS. (2019). *Analysis of administrative burden arising from the CAP: Final report*. Publications Office of the European Union. https://data.europa.eu/doi/10.2762/521652

In chapter 8 of the Better Regulation Toolbox edition from 2023 [75] Tool #58 presents the administrative costs and the 'Standard Costs Model':

"Whenever a measure is likely to impose significant administrative costs on business, citizens or public authorities, the EU Standard Cost Model should be applied to the extent that the underlying data is available. The main aim of the model is to assess the net cost of administrative obligations imposed by EU legislation."

The tool provides a step-by-step approach to calculate administrative costs both for beneficiaries, as well as administration.

Box 13. The core equation and the step-by-step approach of the Standard Cost Model

The core equation of the Standard Cost Model is:

$$Administrative\ cost = \Sigma\, PN \times QN - \Sigma\, PR \times QR$$

where
P (for Price) = Tariff × Time;
Q (for Quantity) = Number of businesses × Frequency;
and N – new obligations, R – removed obligations at EU/ national level

The step-by-step approach is:

Phase I: Preparatory Analysis

Step 1: Identification and classification of additional administrative obligations (e.g. setting up CIS-YF may involve setting up training programmes for young farmers and the development of plans and criteria for business plan approvals).

Step 2: Identification of required complementary actions (e.g. training the staff involved in business plan approval)

Step 3: Identification of target group(s), also called segmentation (e.g. the definition of 'young farmers' and procedures for how they can prove eligibility).

Step 4: Identification of the frequency of required actions (e.g. CIS-YF may be granted contingent upon progress made in training that takes a few years to complete).

Step 5: Identification of relevant cost parameters (e.g. costs for courses or to obtain certificates or for expert reports of a biologist who assesses the change in biodiversity). Qualitative assessment of significant burdens (i.e. recognition of certificates obtained abroad).

Step 6: Choice of data sources and, if necessary, development of data capture tool(s) (e.g. set up a register of relevant qualifications for persons having passed training courses to check eligibility).

Phase II: Data capture and standardisation

Step 7: Assessment of the number of entities concerned (e.g. 1 000 young farmers per year).

Step 8: Assessment of the performance of a 'normally efficient entity' in each target group (e.g. in the case of young farmers, some may have undergone vocational training already and others may need to make the training on the second educational pathway: firstly, a definition of 'normal or the standard case' needs to be made and secondly alternative routes need to be defined in order to separate different classes of persons eligible).

Phase III: Calculation and reporting

Step 10: Assessment of the 'business as usual' costs, extrapolation of data to the level of the programme (assessment of the proportion of the costs that would have been born even if there had been no CIS-YF).

Step 11:

a) Reporting of costs in the cost-effectiveness assessment.

b) If no cost-effectiveness assessment is conducted, then reporting is done in an evaluation report (e.g. the report of CIS-YF intervention).

Source: Better Regulation Toolbox [76]

2. The second task is to put the costs in relation to the effects of the CAP income support interventions:

- Effectiveness regarding income level (more specific the change of the level of income): efficiency is "change in net value added per AWU" (by type of farming, region, farm size, in areas facing natural or specific constraints) divided per costs of intervention (by type of farming, region, farm size, in areas facing natural or specific constraints).
- Effectiveness regarding income stability (more precisely change in volatility): efficiency is "change in coefficient of variation of income (by type of farming, region, farm size, in areas facing natural or specific constraints) divided by the cost of the intervention (by type of farming, region, farm size, in areas facing natural or specific constraints)".
- Effectiveness regarding income distribution (more precisely change in distribution): efficiency is "change in the Gini coefficient (by type of farming, region, farm size, in areas facing natural or specific constraints) divided by the cost of the intervention (by type of farming, region, farm size, in areas facing natural or specific constraints)".

[75] For more details, see: Better Regulation Toolbox, 2023. Tool number 58 pp. 523
[76] For more details, see: Better Regulation Toolbox, 2023. p-524.

There are several examples where cost-effectiveness analyses were carried out in the context of agricultural policy or the food value chain. For a study region in Germany the cost-effectiveness of agri-environmental schemes was analysed [77]. A methodology for the food chain area was developed by the JRC [78]. This report presents case studies where the methodology is demonstrated.

How to calculate the Income Transfer Efficiency

The application of econometric models provides an essential contribution to the analysis, since they allow the estimation of the net effect of the considered policy, accounting for the fact that the level of income depends also on many other factors, mostly related to farm and farmer characteristics as well as the environment in which the farms operate.

The econometric approach allows the identification of statistical relationships between farm income level and a set of explanatory variables expected to influence them, including the amount of support provided by the policy. Hence, it allows for testing whether a significant relationship exists statistically, its sign (positive or negative) and its magnitude, accompanied by a confidence interval. If the parameter of a policy measure is statistically different from zero and positive in sign, it can be assumed that the measure contributes to supporting farm incomes. The magnitude of the parameter provides an estimation of this contribution that does not depend on the relative importance of the policy component because the coefficient provides an estimate of the marginal effect of an additional euro spent.

These methods could be applied to the ISI of the new programming period when data will be available. These methods are based on different assumptions, depending on how the relationship is assessed and the statistical approach.

Description of the econometric models used to assess the efficiency of the CAP direct support.

The following models are described in chapter 3:

A. Cross-section model

B. GMM-SYS model

C. QDRF and QCTE model

Furthermore, for each model, examples of data requirement are provided.

2.5.4. Interpretation of findings

Cost-effectiveness is the method recommended in the Better Regulation Toolbox for evaluating the efficiency of programmes. In the context of this document, cost-effectiveness is applied to ISI. Cost-effectiveness is a number and to interpret it well, it is necessary that the definitions of effects and costs are clear and explicit. There is not only one way how cost-effectiveness can be evaluated, e.g. year-by-year evaluations are possible and it is also possible to add all effects and costs of the whole period together.

For clarity, it is advisable to present the calculated cost-effectiveness results for each intervention of interest and compare their cost-effectiveness relations. The results can be used to rank all interventions that are income relevant with regards to the three income criteria used in the effectiveness analysis. There are several possible outcomes of the calculations:

- The levels of income may not be affected or even decrease, but volatility may decrease and/or incomes become less concentrated. In such a case, there is a trade-off between the level and volatility/equity. The assessment of whether such an outcome indicates a successful intervention or not should be made by referring to the needs.
- It may turn out that some interventions are performing better than others and the interpretation. In such cases, the interpretation is that those with better scores are superior and it may be necessary to explore options for improving or abandoning them.

The aggregated results should be complemented by detailed breakdowns in supplementary tables. There administrative and adjustment costs should be differentiated between (potential) recipients and administration, fixed and running costs should be broken down and the evolution over the programme period should be shown. Such detailed figures may not be interesting for all stakeholders but may be helpful for those who design and implement interventions and may be interpreted in different ways:

- The cost breakdown of adjustment costs for all interventions might reveal differences. Interventions that were not programmed in a previous period are expected to have higher adjustment costs. Comparing adjustment costs may give clues on how to design interventions in future programmes.
- The breakdown of administrative costs and the differentiation of fixed and running costs will show differences among interventions as well. It may turn out that the use of digital tools is not lowering the costs as expected. In such a case, procedures should be improved.
- The cost breakdown will reveal how much adjustment/ administrative costs are borne by the administration and recipients. It may turn out that high costs in the administration are associated with low costs for recipients or the other way. There are likely to be differences between interventions as well. Calculating scores and comparing the different dimensions may reveal where improvements should be made.

[77] Markova-Nenova, N., Wätzold, F., & Sturm, A. (2023). Optimizing agri-environment schemes for cost-effectiveness, fairness or both? *Q Open, 3*(1), qoad005. https://doi.org/10.1093/qopen/qoad005

[78] European Commission. Joint Research Centre. & Competence Centre on Microeconomic Impact Evaluation (CC ME). (2019). *Cost effectiveness analysis: Methodology for the food chain area : final report.* Publications Office. https://data.europa.eu/doi/10.2760/270802

When interventions are compared to one another, it is important to remember that some interventions may address not only one specific objective. In such a case, it is not possible to attribute all the costs to each of the specific objectives because this would lead to inflating the costs. A pragmatic way to deal with such interventions is to carry out econometric assessments to identify how much of a given effect is due to a given intervention. This requires carrying out an analysis that includes all relevant interventions simultaneously and not one by one. Limited data availability may prevent that such an approach is feasible, but where possible, such an analysis should be conducted. The costs of an intervention could then be scaled down to the level by how much it contributes to the specific objective of interest.

Income Transfer Efficiency is a complementary method to the cost-effectiveness analysis. The main difference is that transfers to beneficiaries, considered for the calculation of ITE, are only part of the total public costs associated with an intervention considered under cost-effectiveness analysis. In cases in which the amount of 'transfer' is the only cost component of an intervention, then the data requirements to calculate both cost-effectiveness and ITE may be just the same. However, cost-effectiveness and transfer efficiency analyses will yield slightly different results. The deviation will depend on the wedge between transfers and income.

3. Method for netting out the CAP impact on farm income indicators

This chapter is dedicated to the assessment of the net contribution of CAP support on farm income and the netting out of impact indicators.

3.1. General approach for assessing the net contribution of CAP income support interventions

Income support is not all converted into additional income for beneficiaries. After a potential reduction from transaction costs in the disbursement process, the additional revenue from the support (and the eventual conditionality of the support) might lead the farmer to take various actions (e.g. buy inputs, invest, change production mix and set aside some land, etc.) that have an impact on farm income because of decreasing revenues and/or increasing costs. A second order impact on other farmers comes from the potential market adjustments following a higher demand (of inputs) and supply (of output) caused by the income support. Therefore, estimating the farm income without income support cannot be done by simply subtracting the support. Some econometric tools can be used to isolate the part of the income variation that can be attributed to income support (i.e. the net impact of income support). The choice of impact evaluation approach depends on available data and indicators of interest. Those points are discussed in the next two sub-sections.

Box 14. Definitions relevant to discuss impact evaluation approaches

Statistical significance: This refers to the likelihood that a relationship observed in a data set is not due to random chance. Statistical significance is often determined using a p-value, with a lower p-value (typically less than 0.05) indicating a higher likelihood that the observed relationship is indeed significant and not just a random occurrence.

Causality: Causality refers to the relationship between causes and effects. It implies that a change in one variable (the cause or independent variable) directly changes another variable (the effect or dependent variable). Establishing causality is a central goal in many scientific and social science studies.

Endogeneity: Endogeneity occurs when an independent variable in a regression model is correlated with the error term, often due to omitted variables, measurement error, or simultaneous bias. This correlation can lead to biased and inconsistent estimates of the model coefficients.

Simultaneity bias occurs when there is a mutual relationship between the independent variable (income in our case) and the dependent variable (CAP support in our case). Example: the relationship between education and income. Education is often used as a predictor of income. However, this relationship can be endogenous, that is income can also predict education because high income person can more easily access high levels of education.

Selection bias: This occurs when the sample used in a study or analysis is not representative of the population from which it was drawn. This can lead to skewed results and conclusions that do not accurately reflect the reality of the broader population.

Example of selection bias: A group of farms receive a subsidy and the reasons behind granting the subsidy (e.g. farm size, years, operating, types of productions, output, etc.) need to be accounted for. For example, selection bias can lead to an overestimation of the positive effects of CAP support on farm income because the sample of supported farms may be biased towards farms that benefit from more support than others.

Omitted variable bias: This type of bias arises in statistical models when a relevant variable (i.e. that influences the dependent variable) is left out of the model. This omission can lead to incorrect estimates of the effects of other variables included in the model.

Example of omitted variable bias: when modelling farm income, not accounting for weather conditions, farm characteristics, managerial abilities, or any other important driver of revenues.

Counterfactual: In the context of causal inference, a counterfactual refers to the hypothetical scenario of what would have happened to the same units (such as individuals or groups) had they not been exposed to the treatment or intervention being studied. It is a fundamental concept in establishing causality.

Unconfoundedness: This is a condition in causal inference where the treatment assignment (or exposure) is independent of the potential outcomes, given a set of covariates. When this condition holds, it is possible to obtain unbiased estimates of causal effects.

Example of unconfoundedness not met: when estimating the effect of CAP subsidies (the treatment) on farm income (the outcome), suppose there is a dataset of farms with information on whether they received CAP subsidies, their income, and other covariates such as farm size, type of crops grown and location.

If the unconfoundedness assumption holds, the assignment (receiving or not receiving) of CAP subsidies is independent of the potential outcomes (farm income if the farm received the subsidy and farm income if the farm did not receive the subsidy), given the covariates. In other words, once controlling for farm size, type of crops and location, the assignment of CAP subsidies does not provide any additional information about the potential farm incomes.

Ignorability: It is a synonym of unconfoundendess.

Covariates: Covariates are variables included in statistical analyses to control for their effects on the outcome being studied. They help isolate the effect of the primary independent variables on the dependent variable and are crucial for reducing confounding in research models.

Fixed and Dependent Variable:

Fixed variable: Also known as an independent variable, refers to values controlled or predetermined by the researcher. It is hypothesised to cause or influence the dependent variable.

Dependent variable: This is the variable being tested and measured in an experiment or study. It is 'dependent' because its values depend on the influence/effects of the independent (fixed) variables.

Source: EU CAP Network supported by the European Evaluation Helpdesk for the CAP (2024)

3.1.1. Choosing the impact evaluation approach

What is the available data? While the PMEF income related impact indicators are calculated from aggregate level data, establishing the causal relationship between the income support and the impact indicators requires an analysis at a more granular level. This impact evaluation will require farm level data, for a sufficiently large sample of farms. Depending on the chosen methodology, a set of additional variables might also be needed to control for other drivers of agricultural income (e.g. farm characteristics, location characteristics, output market, input market, other types of policy support, external factors, etc.).

Based on these requirements, the main source of data to be used for the impact evaluation econometric models will be farm level FADN data. For each farm, income will need to be computed as described in the PMEF indicator guidance fiche. The farm level data should also include all payment data, aggregated or by intervention type (i.e. the level of income support delivered to each farm). If the income support data cannot be obtained at farm level and matched to income data, then an aggregation at the smallest common unit (e.g. geographical unit, size, type – depending on the econometric model capability) will be required. Such a step might limit the available methodological approaches in the next stage.

What are the available approaches? Based on the characteristics of the interventions to be assessed (independent variable), the area of impact (dependent variable) and the likely available data from the outset, multiple standard impact evaluation techniques can be discarded from the income impact evaluation toolbox. All methods relying on randomisation of the treatment (e.g. randomised control trials (RCT)) are not suitable. Most methods relying on comparing a group of treated units (farms) and non-treated units are also out of scope since all the farm population is eligible for some form of income support.

Methods based on thresholds (e.g. regression discontinuity design) could be considered for some income supporting interventions in the presence of an eligibility threshold that would create a group of similar farms around the threshold. However, the validity of the conclusions from that analysis rarely translates to all farms (i.e. farms far away from the threshold). General conclusions valid for the whole population behind the impact indicator are also needed.

This leaves the evaluators with only the econometric methods adapted for continuous impact and treatment variables applied to the whole population (no control group). These methods are:

- Cross-section model. This approach has been implemented by Agrosynergie in 2020 [79]. Farm income data was regressed against a set of independent variables, including CAP income support levels.
- GMM-SYS model. System Generalised Method of Moments (SYS-GMM) adopted in Biagini et al., (2020) [80] was employed to examine Income Transfer Efficiency. This method is especially valuable when investigating the dynamic aspects of income and evaluating the short and long-term effects of CAP measures. The SYS-GMM method is beneficial when dealing with variables that remain constant over time at the farm level, also known as individual fixed effects (FE). These constant variables are problematic when evaluating the Impact Treatment Effect (ITE). However, they can be removed using a first-difference transformation, which involves subtracting the past value of the variable from its current value for the same individual. Moreover, SYS-GMM considers time invariant farm-specific characteristics such as farm specialisation, managerial abilities and soil characteristics. By incorporating one or more lags of the dependent variable, this methodology effectively addresses potential issues related to endogeneity in the analysis of CAP subsidies. This issue is relevant in regression analysis because it makes difficult to correctly estimate the effect of the regressors.
- QDRF and QCTE model. The Quantile Dose-Response Function (QDRF) and the Quantile Continuous Treatment Effect (QCTE) are statistical models used to analyse the impact of direct payments on farm incomes. The QDRF estimates how different levels of direct payments (treatment doses) affect income by examining the potential response of each dose at different levels (quantiles). The QCTE estimates the causal effect of a treatment (amount of direct CAP support) on different portions of the distribution of the outcome (income). Hence, in contrast with a simple Average Treatment Effect estimation, which gives the average effect across all sampled farms, this approach provides a way to assess whether the ITE of the CAP support differs according to the income level of the considered farms (quantiles). This approach takes into account that the treatment (CAP support) is a continuous variable (e.g. it is not a binary variable which we have only treated and not treated) and vary (continuously) among farms.

[79] European Commission. Directorate General for Agriculture and Rural Development. & EEIG AGROSYNERGIE. (2020). Evaluation study of the impact of the CAP measures towards the general objective 'viable food production": Final report. Publications Office. https://op.europa.eu/en/publication-detail/-/publication/92c6be0f-2494-11eb-9d7e-01aa75ed71a1/language-en

[80] Biagini, L., Antonioli, F., & Severini, S. (2020). The role of the common agricultural policy in enhancing farm income: A dynamic panel analysis accounting for farm size in Italy. Journal of Agricultural Economics, 71(3), 652–675. https://doi.org/10.1111/1477-9552.12383

3.1.2. How to choose between the available approaches?

The approaches outlined above all require technical skills and can be complex to implement. The accuracy of the results is generally positively correlated to the level of complexity induced by the method.

The choice of approach should be guided first by the availability of data. Without three years of implementation data, the SYS-GMM will not be feasible. A large dataset is also advisable for the QDRF-QCTE model.

The technical skills of the impact evaluator team (econometrics) will also be crucial in choosing between the QDRF-QCTE and simple cross-sectional analysis. The former requires an advanced level of econometrics skills and the ability to develop custom statistical code, while the latter can be implemented with off-the-shelf statistical libraries available in most software.

Table 12 below offers some structure to compare and choose between models. More details are provided on the characteristics, advantages and limitations of each model in the next chapter (3.2).

Table 12. Summary of key differences across impact evaluation methods

	Cross-Section	SYS-GMM	QDRF - QCTE
Complexity	**Low**. Basic data cleaning and processing. Use of standard econometric libraries.	**Medium**. Use of standard econometric libraries. Sensitive model specifications.	**High**. Currently need custom code development and highly sensitive model specification.
Accuracy of estimates	**Low**	**Medium**	**High**
Data requirements	**Low**. At least one year. Farm level data (incl. support).	**High**. At least five years. Farm level data (incl. support).	**Medium**. At least three years. Farm level data (incl. support).
Ability to eliminate biases	**Low**. Through control variables. But limited ability to deal with endogeneity and simultaneity [81].	**Medium**. Through control variables and first-difference lagged estimators.	**High**. Through control variables and artificial counterfactual.
Limitations	Results should be interpreted as 'correlation' between variable and not causation. Cannot deal with simultaneity bias nor omitted variable bias.	Requires at least three years of data.	Highly complex to implement. Data intensive.
Advantages	Less data required (one year). Less complex to implement.	Addresses some of the limitations of the Cross-Section (CS) model (e.g. endogeneity, etc.). Captures the time dimension. Offers some insights on causality.	Offers insights on causality. Robust approach.

Source: EU CAP Network supported by the European Evaluation Helpdesk for the CAP (2024)

[81] Challenge to quantify and untangle the respective impact of two different factors when their action takes place simultaneously.

3.1.3. Outlining the impact evaluation strategy

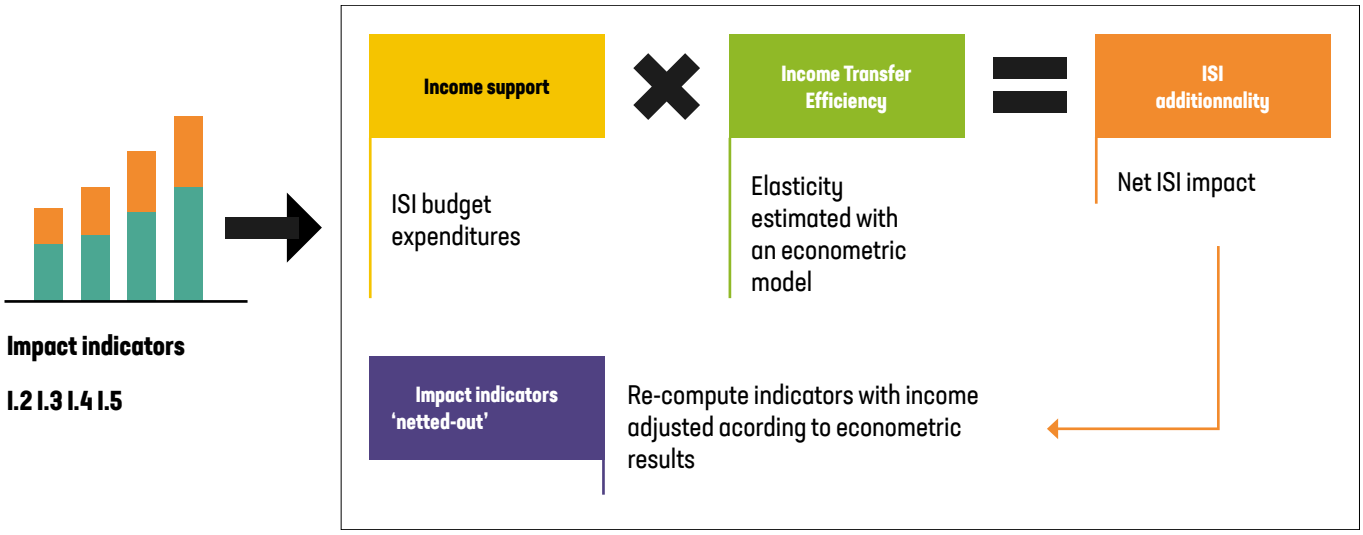
The remainder of this document develops guidelines and recommendations to quantify the contribution of CAP income support to the **agricultural income related impact indicators** [82] of Annex III of the implementing regulation:

- I.2 – Reducing income disparities: Evolution of agricultural income compared to the general economy
- I.3 – Reducing farm income variability: Evolution of agricultural income
- I.4 – Supporting viable farm income: Evolution of agricultural income level by type of farming (compared to the average in agriculture)
- I.5 – Contributing to territorial balance: Evolution of agricultural income in areas with natural constraints (compared to the average)

These four indicators are further defined in the PMEF [83].

The overall impact evaluation strategy for the four indicators and developed later in this chapter can be summarised as follows:

Figure 8. Steps to net out ISI impact indicators



Source: EU CAP Network supported by the European Evaluation Helpdesk for the CAP (2024)

Two main steps include (1) the deployment of an impact evaluation methodology to **estimate the impact of income support interventions** (ISI) on agricultural income (i.e. the level of ITE) and (2) the use of the estimated ISI impact to **generate an alternative income level, without the ISI impact,** to be used in the construction of a different version of the PMEF impact indicators (i.e. a netted-out version of the indicators without the ISI contribution).

The applications of these steps to the four impact indicators, developed later in this document, can be summarised as follows:

- I.2 Evolution of agricultural income compared to the general economy. Compute the indicators as recommended in the PMEF indicator guidance note. Use CAP impact on agricultural income to modify the income indicators used in the I.2 calculation.
- I.3 Evolution of agricultural income. Conduct an impact evaluation of the CAP on agricultural income as described later. Then use the results to conclude the CAP impact on I.3.
- I.4. Evolution of agricultural income level by type of farming (compared to the average in agriculture). Deploy the same impact evaluation strategy as for I.3, but by type of farm and size, and generate the alternative income levels without ISI and corresponding I.4 indicators.
- I.5 Contributing to territorial balance: Evolution of agricultural income in areas with natural constraints (compared to the average). Deploy the same impact evaluation strategy as for I.3, but by farm location and generate the alternative income levels without ISI and corresponding I.5 indicators.

The I.3 impact indicator is the percentage variation of an index of agricultural factor income per annual work unit compared to its last three year average. Assessing the impact of the CAP income support on I.3 requires evaluating its impact on agricultural factor income. The agricultural factor income measures the remuneration of all factors of production and is defined as follows: **agricultural production value – intermediate consumption – depreciation – taxes + subsidies**.

[82] Article 1 of the Commission Implementing Regulation (EU) 2022/1475 requires Member States to evaluate the contribution of their strategic plans along the effectiveness, efficiency, relevance, coherence, and Union added value dimensions. Article 6 of the same regulation further indicates that this regulatory evaluation should be based on the PMEF and that "Member States shall quantify the contribution of the CAP Strategic Plans to the development of at least the common impact indicators set out in Annex III to this Regulation".

[83] For more information, see PMEF – Context and Impact Indicators: https://agriculture.ec.europa.eu/common-agricultural-policy/cap-overview/cmef_en#towardsthepmef

CAP income support interventions affect all elements of that equation, either directly or indirectly. CAP subsidies, granted to farmers, have a direct positive effect on the level of agricultural income. Then, by supporting farming activities, CAP interventions also play an indirect role in the production and its geographical distribution, which may affect output prices, shape the demand for intermediate input and drive depreciation to some extent through influencing investment decisions (and fixed capital formation).

Agricultural factor income determination is therefore highly endogenous (one component drives the other and vice versa). And the income support potentially affects directly or indirectly all components.

For simplicity's sake and clarity of the rest of this document, the following assumptions are made for the next steps:

- The approaches presented focus on establishing the impact of income support interventions on the aggregate agricultural factor income (not on its sub-components), which therefore will be the dependent variable in an impact model, even though the impact is differentiated across the different component of factor income.
- The impact of CSPs on agricultural factor income mostly comes from CAP income support interventions (BISS, CRISS, CIS, ANC). The independent variables will therefore include some form of income support intensities.

The I.4 and I.5 impact indicators are based on FNVA which is similar to factor income and defined as the portion of agricultural output that can be used to remunerate fixed factors of production. It can be expressed as: **production value + CAP payments + subsidies + VAT balance – intermediate consumption – farm taxes – depreciation = FNVA**

I.4 is the FNVA by type and size of a farm, I.5 by region (ANC and non-ANC).

Those indicators have the same endogeneity characteristics in their determination. We will therefore adopt the same assumptions as for I.3.

The I.2 impact indicator is made of three sub-indicators:

- Agricultural entrepreneurial income plus compensation of employees per annual work unit.
- Farm net income plus wages and social security charges by total AWU.
- Farm net income minus opportunity costs for own production factors (land and capital) by total family work units.

The first one (entrepreneurial income) is built from the factor income adjusted for rent and interests, which enables the same approach as for I.3.

The second is obtained from FNVA and can therefore be treated as in the I.4 evaluation approach.

Finally, the third one starts from farm net income, which is defined as FNVA minus wages and social security charges, rent and interest paid. We therefore focus on establishing the FNVA without ISI impact from which we subtract wages and social security charges, rent and interest paid.

Summary of approaches:

Steps to evaluate the impact of ISI on I.3:

1. Establish the impact of ISI on income. This will require selecting and implementing an impact evaluation model.
2. Use impact coefficients (ITE) and ISI budget to prepare a version of the factor income with and without ISI contribution.
3. Compute two versions of the index and its three year average.
4. Compare the percentage deviation to the latest three year average (i.e. I.3).

Steps to evaluate the impact of ISI on I.4 and I.5:

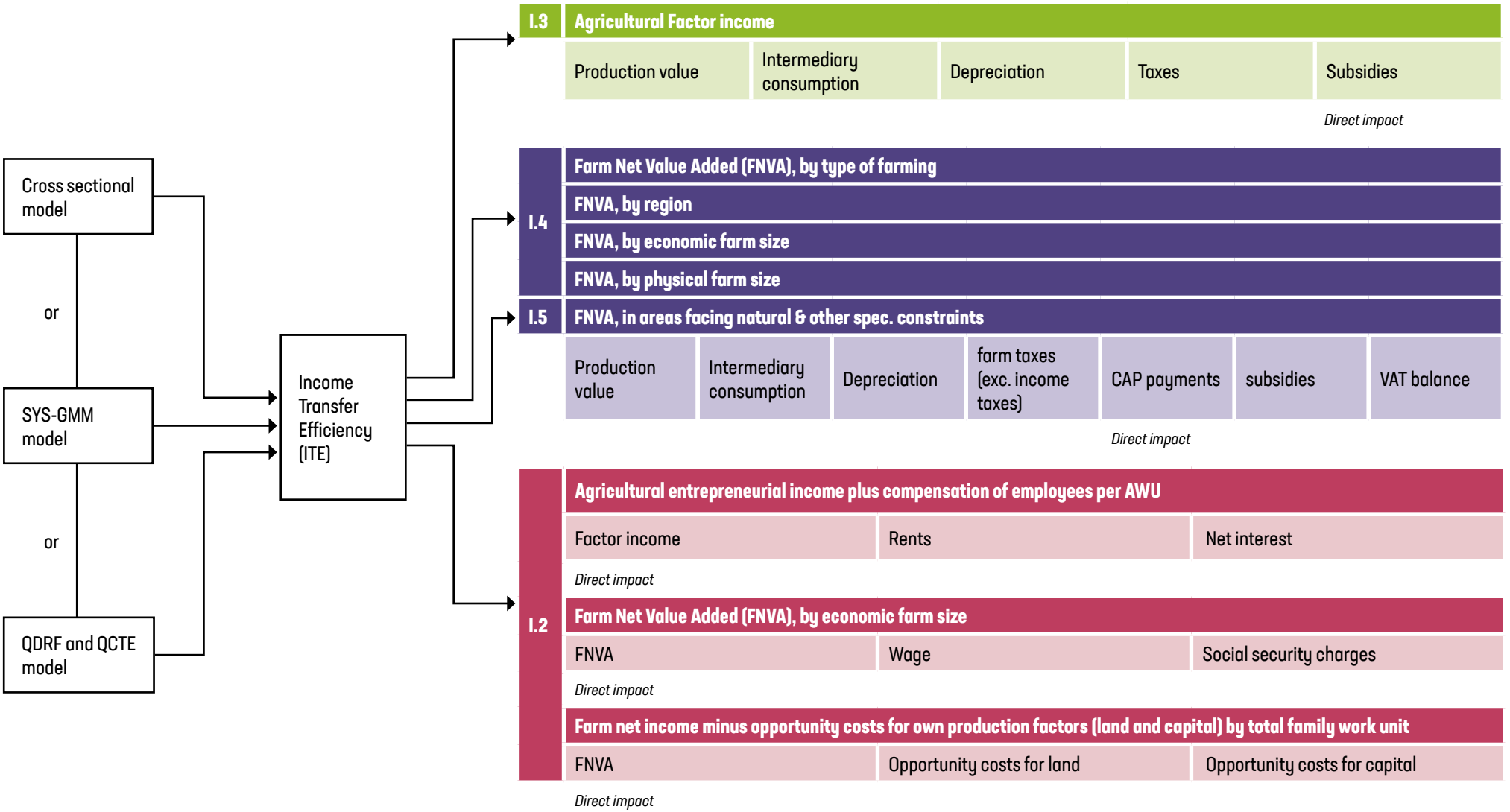
1. Since the FNVA and the agricultural factor income are similar indicators, we will treat them in the same way, applying impact coefficients (ITE) estimated from the income impact model onto the FNVA which is the main component of I.4 and I.5. The key difference is the need to run the model with the same disaggregation dimensions of I.4 and I.5 (farm types and regions).
2. These coefficients will then also be used in the same way to build an alternative version of the impact indicators without the impact of the ISI.

Steps to evaluate the impact of ISI on I.2:

1. Extract impact coefficients (ITE) for ISI.
2. Use the coefficient(s) to modify the I.2 sub-indicators.
3. Compare the sub-indicators with and without the adjusted income.

These steps are presented in the figure below.

Figure 9. Overview of impact evaluation models and impact indicators



Source: EU CAP Network supported by the European Evaluation Helpdesk for the CAP (2024)

3.2. Evaluating the Income Transfer Efficiency of CAP income support interventions

3.2.1. Limitations and overview

Three methods have been used in the past to assess, with historical data (ex post), the Income Transfer Efficiency of CAP measures from previous programming periods:

- Cross-Section (CS)
- System-GMM (Sys-GMM)
- Quantile Dose-Response Function (QDRF) and the Quantile Continuous Treatment Effect (QCTE)

These methods could be applied to the income support instruments (ISI) of the new programming period when data will be available (see section 1.3.3 on how to use data from previous programming periods to assess ISI).

These methods are based on different assumptions, depending on how the relationship is assessed and the statistical approach.

Each of these will be described in the following section. Each model is described according to the following structure: general model, assumptions, estimation strategy, data needs, type of results and how to interpret them, and limitations.

Heterogeneity of ITE estimates

The analyses refer to a set of policy measures. The model can refer to the overall support provided by all considered CAP interventions or each intervention separately if the data allows for this. The latter approach allows us to assess whether the ITE level differs according to the specific policy instrument.

The ITE could also be evaluated across different farm groups, for instance, based on farm size (i.e. small, medium, large), support amount, type of farming (i.e. production orientation), region (e.g. ANC and non-ANC), Member States and other additional farm or regional characteristics. Consequently, the ITE level can exhibit variation within the farm population.

It is crucial to acknowledge that these methods typically necessitate relatively large datasets (i.e. numerous observations), sometimes requiring at least three years of observation. Therefore, disaggregated analyses may not always be feasible [84]. Moreover, executing the models on numerous farm subsets can be extremely time-consuming. This factor should be carefully considered when planning the analysis.

3.2.2. Cross-Section (CS) model to estimate ITE

General model

The model tries to assess the link that exists between the level of farm income (dependent variable) and a set of other variables that, as the amount of CAP support, is expected to affect the level of income. The latter are called regressors or independent variables in regression models.

Formally the model looks like the following:

$$Y_i = \alpha_{i0} + \alpha_1 CAPi + \alpha_2 X_{2,i} + \ldots + \alpha_n X_{n,i} + \varepsilon_i$$

Where:

- Y_i refers to the income of a generic i-th farm i;
- CAPi is the overall support provided by considered policy measures (ISI in future evaluations) to the i-th farm in the sample;
- Variables from $X_{2,i}$ to $X_{n,i}$ refer to n-1 possible control variables that are expected to affect income level (i.e. farm characteristics or other contextual factors);
- ε_i refers to the error terms (i.e. unexplained income differences across farms of the sample);
- From α_0 to α_n are parameters to be estimated (i.e. the unitary contribution of each of the different factors to farm income).

Note that the model can be tailored to include in the set of dependent variables the overall amount of support provided by ISI or the support provided by different types of ISI interventions separately. This basic model represents the starting point for the other models described in the next sections.

Estimation strategy

The model can be estimated on different units. Previous analyses [85] have applied this model to two set of data:

- At national level (NUTS 1), based on data from Eurostat (Economic Accounts for Agriculture and Agricultural labour input statistics). This approach requires many NUTS 1 entities and therefore will not be possible for an evaluation within a single Member State.
- At farm level, based on individual farm data provided by FADN.

The estimation method can be Ordinary Least Squares (OLS) even if other statistical estimation methods are available for CS models.

[84] Also see challenges associated with constant samples in the FADN presented in section 2.2.4

[85] European Commission. Directorate General for Agriculture and Rural Development. & EEIG AGROSYNERGIE. (2020). Evaluation study of the impact of the CAP measures towards the general objective "viable food production": Final report. Publications Office. https://op.europa.eu/en/publication-detail/-/publication/92c6be0f-2494-11eb-9d7e-01aa75ed71a1/language-en

Assumptions

The primary assumption of the model is that selected independent variables should account for a substantial part of the observed in-sample variability of income levels, thereby implying the absence of omitted variable bias. Omitted variable bias arises when a model excludes a relevant variable, leading to the model incorrectly attributing the income driving effect of the omitted variable to the included variables (e.g. if the model did not account for farm size).

If the model is solely based on data from a single year, it presumes that the explanatory variables at time influence the farm income level in the same year. This suggests that the model does not take into account the effects of the CAP interventions on the income of subsequent years.

Finally, the model assumes the absence of a strong correlation or multicollinearity among the explanatory variables. Multicollinearity occurs when two or more explanatory variables in a regression model are highly correlated, implying that one can be linearly predicted from the others with a high degree of accuracy (e.g. the price of two substitutable crops). This can result in unstable and sensitive estimates of the regression coefficients.

Data needs

The main advantage of CS methods is that they can be estimated on data from a single year. For the analysis at country level, data from Eurostat (Economic Accounts for Agriculture and Agricultural labour input statistics) should be complemented with data from the CATS database (Clearance of Audit Trail System) to include data on the CAP support, noticeably, provided by ISI. Previous analyses of income support have used the agricultural factor income per AWU as the dependent variable. Additional variables affecting the income, could be included as explanatory variables and should be obtained from other Eurostat datasets. Note that country level of analysis is unlikely for the evaluation of a single CSP and its income support. In this case, for useful insights, the assessment should be based on farm level data.

The analysis based on individual farm data provided by FADN can be complemented with additional variables to account for the specificity of the countries/regions in which individual farms are located and price indexes. Previous analyses have used FNVA per unit of labour (AWU) as the dependent variable. The total amount of labour can be used to standardise the independent variables.

Box 15. Example of data requirement for cross-section model

A cross-section model was applied at the individual farm level in the evaluation developed by Agrosynergie (2020) using the FADN data complemented with some additional information. This box describes the main technical features of this application.

The model's dependent variable is the FNVA per agricultural work unit (FNVA/AWU). The analysis focuses on some variables referring to the support provided by the CAP. Two models were developed. The first analysed the whole amount of CAP annual payments (from various CAP interventions) and was named Total Annual Payments (TAP). TAP and all other variables referring to CAP support were standardised per unit of labour (i.e. divided by AWU). The second model distinguished coupled direct payments, decoupled direct payments and annual payments provided by the RDP measures (CDP, DDP and RDPa). The first model is used to assess the overall ITE of the aggregated considered support, while the second model is used to assess whether the ITE of these latter three groups of measures differ. We refer to this set of variables as explanatory variables.

The models also included a set of additional control variables.

All the variables are included in the following table.

The selected explanatory variables describe first other policies that, while relevant, entails a more indirect impact on farm income. Because of this, Agrosynergie kept support to farms investment as a separate variable. To account for the fact that such support could impact farm income even in the years after the support is granted, this variable was referring to also the support provided in the previous two years.

A relevant set of control variables refers to the main relevant farm characteristics such as: relative amount of capital available, farm size, production orientation, farm location (i.e. altimetry zones), relative importance of intermediate consumption and depreciation, relative amount of family labour, available land and use of organic production technology. Some of these variables are categorical and should be included in the model using dummy variables. All these pieces of information are available in the FADN dataset.

Another set of control variables refers to the socio-economic environment in which the farms operate. These refer to the level of economic development, unemployment rate and importance of the farm sector in the national economies where farms are located. A fourth set of variables refers to the price evolution and includes: price indexes for the whole set of goods and services, price indexes for farm products and farm inputs. The variables of these latter two sets of variables are obtained by the regional or national statistics provided by Eurostat. These are combined with individual farm data referring to the region in which each farm is located.

Description of the control variables used in the model by Agrosynergie (2018)

Code	Description	Unit of Measurement	Source
RDPo	RDP farm support other than RDPa	PPS/AWU	FADN
K/L	Capital over Labour input	PPS/AWU	FADN
SIZE	Farm Size	SO	FADN
SIZE_SQ	Farm Size Squared	SO^2	FADN
TF2	Horticulture	Dummy (0; 1)	FADN
TF3	Wine	Dummy (0; 1)	FADN
TF4	Other permanent crops	Dummy (0; 1)	FADN
TF5	Milk	Dummy (0; 1)	FADN
TF6	Other grazing livestock	Dummy (0; 1)	FADN
TF7	Granivores	Dummy (0; 1)	FADN
TF8	Mixed	Dummy (0; 1)	FADN
ALT2	Altimetry dummy 2	Dummy (0; 1)	FADN
ALT3	Altimetry dummy 3	Dummy (0; 1)	FADN
ALT4	Altimetry dummy 4	Dummy (0; 1)	FADN
COST	(Interm. Cons. and Depreciation)/Tot. Assets	%	FADN
FAWU	Relative amount of family based labour	%	FADN
UAA	Utilised Agricultural Area	ha	FADN
ORGANIC	Organic farms	Dummy (0; 1)	FADN
GDP_PC	Gross Domestic Product pro-capite	Euro/Person	Eurostat
UNEM	Unemployment rate	%	Eurostat
AGR/GDP	Relative importance of the farm sector	%	Eurostat
HICP	Harmonized Index of Consumer Prices	%	Eurostat
Price_Out	Price index for farm products	P Index	Eurostat
Price_Input	Price index for farm inputs	P Index	Eurostat

Source: reproduced from Agrosynergies (2018)

Source: EU CAP Network supported by the European Evaluation Helpdesk for the CAP (2024) and the study of AGROSYNERGIE, (2020), Evaluation study of the impact of the CAP measures towards the general objective 'viable food production'

Type of results and how to interpret them

The econometric model estimates the net impact of an additional unit of support provided by ISI on farm income (i.e. the ITE). If the income support parameter is statistically different from zero and positive in sign, it can be assumed that ISI contributes to supporting farm income. The magnitude of the parameters provides an estimated measure of this contribution. Thanks to the inclusion of control variables (farm and contextual characteristics), we can refer to this coefficient as the net impact of an additional unit of income support.

The analysis conducted by Agrosynergie, on FADN data on the EU-28, for example, a coefficient of 0.171 for the whole support provided by all CAP interventions. This should be interpreted as each additional euro spent on the CAP policies considered is transformed into an additional 0.171 euro of income on average. Note that the model run considering different policy measures separately (run again on EU-28 data) has obtained different coefficients: these are 0.697 for coupled direct payments and 1.147 for decoupled direct payments. This means that while these two measures have a relatively high ITE, the coefficients of the other considered policy measures are lower and often not significantly different from zero. These latter results suggest that the ITEs of the different measures are not the same.

When the value of ITE is lower than 1, the subsidy does not fully translate into an equivalent farm income increase. Note that if the value of ITE is greater than 1, it indicates that the support provided by the policy may have a multiplier effect on income. More income is generated than the value of the subsidy. This could be due to the fact that receiving the support relaxes the financial constraints faced by farmers.

Limitations

Despite its relative simplicity, the cross-sectional model has some limitations to be considered.

First, the model may be susceptible to simultaneity bias, a common issue in econometric analysis. This arises when the dependent variable and the error term are determined simultaneously, leading to a violation of the classical linear regression model assumption that the error term should be independent of the explanatory variables (= fixed or independent variables).

Second, the model may suffer from omitted variable bias if there are relevant variables that have not been included in the set of independent and control variables. This bias occurs when a variable that is correlated with both the dependent variable and one or more independent variables is omitted from the model, leading to biases and inconsistent estimates.

Third, it is essential to note that the **cross-sectional model can only establish correlations** between dependent and independent variables, not causal relationships. This is a fundamental limitation in econometric analysis, as correlation does not imply causality.

3.2.3. System Generalised Method of Moments (SYS-GMM) model to estimate ITE

General model

The model is conceptually like the one described for cross-section analysis, provided that the dependent variable refers to income and the set of independent variables includes variables related to CAP support, alongside control variables.

However, the model is more articulated to take into account the dynamic nature of the process. Furthermore, the variables refer to the change over two adjacent years (i.e. first difference) rather than the level observed in a specific year.

It takes the following general form:

$$\Delta y_t = \alpha_1 \Delta y_{i,t-1} + \alpha_2 \Delta y_{i,t-2} + \sum_{k=1}^{k} \beta_k \Delta ISI_{k,i,t} + \sum_{k=1}^{k} \gamma_k \Delta ISI_{k,i,t-1} + \sum_{k=1}^{k} \delta_j \Delta X_{j,i,t} + \sum_{j=1}^{k} \zeta_j \Delta X_{j,i,t-1} + \tau_t + \eta_i + \varepsilon_{i,t}$$

Where:

- y is the dependent variable, in this case FNVA/AWU;
- i represents the individual farm;
- t the year;
- Δ is the first difference or the value at time t minus the value at time t_{-1};
- ISI_k is the type of ISI support where k is the k^{th} type of ISI support;
- X_j are control variables with j referring to the number of X variables;
- τ is the time effect, η is the individual effect and ε the error therm.
- Finally, α, β, γ and δ are the regressors (e.g. impact coefficients of each type of variable).

In Biagini et al. (2020) [86], the System Generalised Method of Moments (SYS-GMM) is adopted to investigate ITE. This method is useful in situations where there is an individual fixed effect (time invariant farm characteristics such as farm size, geographic location, product specialisation, managerial abilities, different natural characteristics of the soil, etc), which is removed by a first-difference transformation (subtracting past values from current values).

The SYS-GMM estimator, developed by Blundell & Bond, (1998, 2000) [87] [88], includes one or more lags of the dependent variable as regressors. This addresses potential endogeneity issues. In the analysis of CAP subsidies, payments are not assigned randomly and could sometimes depend on farmers' choices, making them potentially correlated to the error term. The SYS-GMM estimator provides a suitable solution for these endogeneity issues using instrumental variables, fixed-effect and robust error term.

[86] Biagini, L., Antonioli, F., & Severini, S. (2020). The role of the common agricultural policy in enhancing farm income: A dynamic panel analysis accounting for farm size in Italy. Journal of Agricultural Economics, 71(3), 652-675. https://doi.org/10.1111/1477-9552.12383

[87] Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. Journal of Econometrics, 87(1), 115-143. https://doi.org/10.1016/S0304-4076(98)00009-8

[88] Blundell, R., & Bond, S. (2000). GMM Estimation with persistent panel data: An application to production functions. Econometric Reviews, 19(3), 321-340. https://doi.org/10.1080/07474930008800475

The SYS-GMM model should be validated through a series of specification tests. These include tests for autocorrelation, the Sargan test for the suitability of the instruments, Wald tests for the specification of the model, and R2 values for the goodness of fit. The results of these tests indicate the overall econometric validity of the SYS-GMM model in the empirical context.

Moreover, the SYS-GMM approach is employed by Biagini et al., (2020) to disentangle ITE across different CAP interventions, i.e. coupled direct payments, decoupled direct payments, rural development payments for agri-environmental schemes, rural development payments for investments. The approach consisted of a model estimation for the whole panel, together with estimations for three distinct farm size groups (i.e. small, medium and large size farms).

Assumptions

The SYS-GMM assumes that the dependent variable, farm income, is influenced by its own past values, i.e. it is autocorrelated. This introduces a potential bias that can be mitigated by implementing specific techniques employed by SYS-GMM, such as fixed effects by first-difference, instrumental variables and robust error terms. Specific tests are employed to verify the robustness of the instrumental variables, the value of the autocorrelation bias, and the robustness of the time and individual effect.

Estimation strategy

A dynamic panel model can be used to estimate the ITE of different ISI. The estimation in this context is achieved using lagged values of the dependent variables, ISI and control variables.

The SYS-GMM estimator is particularly suitable for dynamic panel data models where there is a possibility of endogeneity, simultaneity bias and time invariant omitted variables. A simultaneity bias can occur when input or output prices, or income support (ISI), affect the farm income within the same year as is the case. Time invariant omitted variable bias can be found for example in soil fertility conditions that affect income, which is not observable but time invariant. Fixed effect, and specifically the first difference estimator, eliminates this bias. The SYS-GMM estimator helps to address these issues by using the so-called 'lagged instrument variables' in level and first difference.

SYS-GMM estimator allows for the disaggregation of ITE concerning different farm grouping characteristics, for example, economic size, and considers both short-term and long-term effects.

Data needs

SYS-GMM is used at the farm level using a panel dataset from the FADN. The panel could also be non-balanced. This means that the farms are not necessarily observed in all the years considered.

This method should be applied to a group of farms facing the same policy conditions. Hence, these should belong to the same Member State unless the application of CAP differs within some of these. Second, the time span considered should preferably belong to the same programming period to consider the same CAP design. However, this is not needed if ISI are similar across programming periods. Under this latter condition, data availability is a less binding constraint.

FADN data should be complemented with Eurostat data for price indexes and the deflationary coefficient.

Data should be standardised by dividing the variables by the amount of work (AWU).

Type of results and how to interpret them

The ITE can be determined for different CAP interventions across the entire sample. When that is the case, each ITE can be calculated using the minimum distance estimator (i.e. a method that relies on methods that obtain a single value, minimising the difference between the two regressors' predictions of the model, for example the regressor for time t-1 and for time t-2 for same ISI support), between the regressors and γ obtained using the SYS-GMM estimator for a different type of ISI.

The estimation can also consider the farm size characteristics. The analysis of the three distinct farm sizes can shed light on how the ITE vary among specific groups of farms under consideration (e.g. small, medium and large).

The model provides short and long-run estimates of the ITE. The first allows for an examination of how changes in CAP support can immediately affect income. The second provides an estimation of the cumulative effects over time, which is obtained from the autoregressive characteristic of income.

Finally, the estimated coefficient for the autoregressive income component measures the extent to which past income levels are related to the current level, indicating income 'stickiness'.

Limitations

Limitations are related to data and model:

- SYS-GMM relies on a panel dataset of individual farms (FADN). The dataset must only include farms with at least five years to have lagged values of dependent variables and multiple lagged for independent variables, both adopted as instrumental variables [89].
- Results for farm groups with a small population (e.g. from one region, of one specialisation, etc.) cannot be generalised to other farm groups.

[89] Instrumental variables (IVs) are used to control for confounding factors, endogeneity and measurement error in observational studies.

Box 16. Example of data requirement for Generalised Method of Moments System (GMM-SYS) model

The GMM-SYS model, as used by Biagini et al., (2020), adjusts monetary values using the HICP index from Eurostat to account for inflation.

This model also standardises FNI and the investigated CAP measures using AWU. These CAP measures include coupled direct payments (CDP), decoupled direct payments (DDP), rural development program support for agri-environmental schemes (RDPaes), rural development program support for farm investments (RDPinv) and other rural development program payments (RDPother).

The model also includes control variables to account for factors that influence the relationship between CAP measures and FNI. These factors include production factors like capital, which is divided into 'Land Value' and 'Non-Land Capital Value', and the level of debt, calculated as 'Liabilities/Total assets' (also known as 'Leverage'). The model also considers the ratio of rented land to total land to account for the influence of rent, which considers labour, specifically family labour measured in AWU.

The model also considers the effect of prices on FNI, through three price indicators: Total output of cereals/total output, total output of fruits and vegetables/total output, and total output/total intermediate consumption. Lastly, the model uses total revenue to divide the overall sample into three groups (tertiles) based on farm sizes to evaluate ITE. Some control variables are also standardised by dividing their values by the level of AWU, specifically for land value, non-land capital and family labour.

Source: Biagini, L., Antonioli, F., & Severini, S. (2020). The role of the common agricultural policy in enhancing farm income: A dynamic panel analysis accounting for farm size in Italy.

3.2.4. Quantile Dose-Response Function (QDRF) and the Quantile Continuous Treatment Effect (QCTE) to estimate ITE

General model

The Quantile Dose-Response Function (QDRF) and the Quantile Continuous Treatment Effect (QCTE) are statistical models that have been used to analyse the impact of decoupled direct payments (DDP) on farm incomes. This approach has been used by Ciliberti et al. (2022) [90] to estimate the ITE of decoupled direct payments in Italy.

These methods have been used to estimate how different levels of decoupled direct payments (treatment doses) affected income by examining the potential response of each dose (i.e. a small increase of payments) at different levels of income (quantiles). This helps to understand how changing the level of the treatment (i.e. direct payments) might affect income at different income levels (income quantiles).

Estimation strategy

In contrast with previous models, this approach relies on counterfactual analysis. This analysis allows for the evaluation of the Average Treatment Effect on the Treated (ATT) and the effect of continuous treatment such as direct payment. ATT is the average impact of an intervention or treatment on those who received it. This means that the analysis is focused on farms receiving the considered support (i.e. DDP).

The QDRF is adopted to estimate how different 'doses' of a treatment [91] might affect the outcome (income). It does this by looking at the potential response of each dose of the treatment on the outcome at different levels of treatment (i.e. quantiles of the income).

The approach adopts the extension of the generalised propensity score (GPS) of Hirano & Imbens (2004) [92] to analyse the continuous treatment. It uses weighted quantile regression to estimate the Quantile Dose-Response Function.

Apart from the policy variable, other variables are considered. It is necessary to use specific covariates to consider the confounding factors. These represent variables that affect both treatment (e.g. income support interventions) and dependent variables (i.e. income). It is necessary to conduct sensitivity analysis and robustness checks to ensure the validity of the results.

The QCTE, on the other hand, is used to measure the difference between two QDRFs at a given level of the treatment for any fixed quantile. In simpler terms, it helps to understand how changing the level of treatment (level of direct payments) might affect the outcome (income) at different levels (quantiles). This means that the method allows for changing the ITE level according to both the level of income and level of treatment (i.e. CAP support).

Assumptions

This method is based on several assumptions commonly found in counterfactual analysis.

Firstly, the method assumes unconfoundedness, which means there are no unobserved variables that could significantly alter the final estimates. Secondly, the method incorporates farm-specific, time-constant features in the treatment models to account for potential omitted covariates. These features, which are not included in the model, are assumed to have an impact on the farms. Thirdly, the approach assumes exogeneity, which means that the observed covariates are uncorrelated with the omitted ones. Fourthly, the method assumes a linear relationship between variables. Finally, the method assumes ignorability, or weak unconfoundedness, which means that the treatment assignment (ISI support in this case) is independent of the potential outcomes (income in this case) given the observed covariates. In other words, assumptions are made that the amount of support and income are not affected at the same time by unobserved variables.

[90] Ciliberti, S., Severini, S., Ranalli, M. G., Biagini, L., & Frascarelli, A. (2022). Do direct payments efficiently support incomes of small and large farms? European Review of Agricultural Economics, 49(4), 796–831. https://doi.org/10.1093/erae/jbac013

[91] In Ciliberti et al., (2022), different levels of direct payments.

[92] Hirano, K., & Imbens, G. W. (2004). The propensity score with continuous treatments. In A. Gelman & X. Meng (Eds.), Wiley Series in Probability and Statistics (1st ed., pp. 73–84). Wiley. https://doi.org/10.1002/0470090456.ch7

Data needs

The identification scheme used in the method requires a rich panel dataset of at least three years.

Data should include information on the treatment received (policy support), the outcome of interest (income), and a set of covariates and confounding variables that may affect the relationship between the treatment and the outcome. For example, the amount of land affects both the level of ISI and the Income; in this case, land is a confounding factor.

This method does not necessarily require a balanced panel dataset.

Type of results and how to interpret them

The study shows the degree of the ITE. Hence, the coefficients can be interpreted similarly to the previous models.

However, the ITE is assessed only for the policy under scrutiny.

In contrast with previous models, this approach provides ITE estimations for both the level of income and level of treatment (i.e. CAP support). Hence, the model reveals if the ITE is constant, linear or non-linear in treatment intensity. This allows for an evaluation on whether the ITE level changes for different levels of:

- support (treatment); and
- income.

Because of this, the results of this approach can provide relevant policy recommendations. For example, it can suggest whether reducing the amount of support given:

- to high-supported farms could have a lower impact on income than low-supported farms. This may be the case when high-supported farms have a lower ITE than low-supported farms;
- to high income farms have a lower impact on income than low income farms. This may be the case when high income farms have a lower ITE than low income farms

Limitations

The approach focuses on farms that receive the considered form of support. This constrains the application of the method to only policies that benefit a large share of the farms, such as decoupled direct payments. The number of admissible applicants for both BPS and SAPS schemes in EU-27 for the calendar year 2021 was 5 884 108 [93], and the total number of farms for 2020 was estimated at 9.1 million [94]). In contrast, it cannot adequately analyse instruments strongly targeted to specific groups of farms (e.g. ANC payments).

Some restrictions are introduced during the farm selection process to make it suitable for the identification scheme. Specifically, only farms that receive the considered specific support are included. Consequently, the subset of farms considered in the analysis may not be fully representative of the population. This is because the FADN database is only a sample of farms and the subset of farms receiving the specific support (e.g. ANC) can be very limited. This makes it more likely that the sub-sample does not correctly represent the population benefitting from the specific policy (e.g. beneficiaries of ANC). This limitation becomes very strong when policies benefitting only a small share of the sampled farms.

The method does not account for some potential endogeneity issues, such as reverse causality or omitted variable bias, which may affect the estimated treatment effect. This method can only consider the effects of a single policy instrument. Hence, the method does not account for potential interactions between different measures.

Box 17. Example of data requirement for QDRF and QCTE model

The method is designed to evaluate the impact of decoupled direct payments (DDP) on the net income of farms.

The net income of the farm is the dependent variable in this method and the treatment is DDP. This method allows for the evaluation of the impact of DDP (treatment) on farm income. It is necessary to select the sample of farms, considering various factors such as the farm's location (including regions, altitudes and less-favoured areas), economic size and type of farming.

The method then considers four sets of variables that could influence the net income of the farm. These include other subsidies, inputs, productivity and management practices. In particular, it looks at how coupled direct payments and rural development payments, which are different types of subsidies, are related to the level of net income of the farm. These control variables are necessary to take into account that the income can be affected by other subsidiaries at different levels of DDP. The model also considers inputs such as the amount of labour, the ratio of the family to total labour, the amount of cultivated land, the amount of rented land per work unit, the amount of investments per work unit, machinery power per work unit and total livestock units. These variables help to account for the effect of inputs that entail farm costs and control for potential differences in incentives for farmers in using rented land, capital, and hired labour versus their own land, capital and labour. Productivity is also considered as it is a relevant driver of farm income.

To capture the management practices that impact the organisation of farm activities, production processes and inputs, include the amount of output per work unit, the presence of organic farms, inherited farms and young farmers.

Finally, it must comprise farm-specific time-constant fixed effects to account for common characteristics for all farms that can differ among regions and sectors. These include geographical location, production specialisation and time.

Source: EU CAP Network supported by the European Evaluation Helpdesk for the CAP (2024)

[93] Summary report on the implementation of direct payments (except greening) – Claim year 2021. Accessed February 6, 2024.

[94] Farms and Farmland in the European Union – Statistics. Accessed February 9, 2024. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Farms_and_farmland_in_the_European_Union_-_statistics.

3.3. Netting out the impact indicators with the results of the model

3.3.1. Netting out I.3, I.4 and I.5 with the results of the model

The previous chapter described how evaluators and Member States can select the most appropriate method to evaluate the impact of the ITE of ISI.

This chapter discusses the approach to using these results of the impact evaluation to assess the net impact of income support on the PMEF impact indicators I3, I.4 and I.5. First, a general approach is outlined, then an illustrative example is provided for the case of Italy.

General approach to identifying ISI impact on I.3, I.4, I.5

This section describes the steps to take after the ITE is obtained from the impact evaluation econometric model (i.e. how to use the estimated relationship ISI-income).

The main objective is to use the impact coefficients of the econometric models to modify the data points defined in the indicator fiche of I.3 (Eurostat data) and compute I.3 with and without the CAP impact.

For I.4 and I.5, the process is similar, but it requires more coefficients from the econometric step, by farm type and size or geographic location, to match I.4 and I.5 definitions.

Important note on data sources: The process described below is based on the Eurostat version of the indicators. The Eurostat indicators (e.g. factor income, etc.) are produced at national level, combining all types of farming and farm sizes. Alternatively, national FADN datasets should allow for constructing the impact indicators for different sub-groups of beneficiaries, and leveraging a potentially more granular set of ITE coefficient produced by the econometric model. It is recommended to work with the most granular level of data/results available.

Step 1: Compute I.3 Agricultural Factor Income – with the ISI impact

Download data from Eurostat. The data for the different components of total factor income should be downloaded from Eurostat. Agricultural production and factor income can be obtained from the 'Economic accounts for agriculture – values at real prices' [95] database. Select 'Production value at basic price (code PROD_BP)' and 'Factor Income (code 26000)'.

The factor income then needs to be expressed per AWU, which can be downloaded from Eurostat's 'Agricultural labour input statistics: absolute figures (1 000 annual work units)' [96].

Note that national data sources might be preferable if they allow for a more granular breakdown of the factor income per AWU, as this would be useful when the econometric model allows for distinguishing between different groups of farms.

Build factor income time series. When relying on data from Eurostat, this step simply amounts to dividing the factor income by the AWU data. When working with more granular national data sources or sub-components of factor income, a simple aggregation is required.

Build factor income index. Factor income per AWU is then indexed on a selected base year.

Compute percentage variation from the 3-year average (i.e. I.3). Finally, the year-on-year variation of the index is expressed as a percentage of the moving three year average of the index. This is the indicator of observed income variation, described in the Commission guidance documents. It can be used later in the analysis to compare with and without income support version of I.3 and answer evaluation questions.

Figure 10. Components of agricultural factor income

I.3	Agricultural Factor income				
	Production value	Intermediary consumption	Depreciation	Taxes	Subsidies
					Direct impact

Source: EU CAP Network supported by the European Evaluation Helpdesk for the CAP (2024)

[95] For more information, see Eurostat's data on economic accounts for agriculture – values at real prices: https://ec.europa.eu/eurostat/databrowser/view/aact_eaa04/default/table?lang=en

[96] For more information, see Eurostat's data on Agricultural labour input statistics: absolute figures (1 000 annual work units): https://ec.europa.eu/eurostat/databrowser/product/view/aact_ali01

Step 2: Compute I.3 Agricultural Factor Income – without the ISI impact

Extract the impact coefficient from an econometric model. Depending on the impact evaluation methodology selected, the ITE (the impact of the support) will provide the coefficient for different groups of farms. A simple cross-sectional model or dynamic panel model might produce only one coefficient. But these models could also be set up to produce different coefficients for different groups of farms. In the example of Ciliberti et al. (2022), the results include ITE levels for three farm sizes (three quantiles and an average continuous treatment effect) and various levels of income support. The income support is evaluated on two scales. Firstly, it considers an increase of EUR 100 across five levels of direct payments, ranging from EUR 1 000 to 5 000. Secondly, it examines an increase of EUR 1 000 across six levels of direct payment with intervals of EUR 3 000, ranging from EUR 5 000 to 20 000.

For these cases, deciding whether to combine some coefficients or keep them all is required. Each retained coefficient will require the corresponding income support data and factor income data split in the dataset used to build the impact indicators. In other words, if the model produces a coefficient for small farms and a coefficient for large farms, the I.3 indicator calculation will require the total factor income for small farms, the total factor income for large farms and the corresponding income support budget expenditure in the two groups.

A good practice considers other existing publications with ITE estimates or different versions of the econometric model (robustness checks, which are performed to consider different hypotheses compared to the evaluated model) and the use of a range of coefficients to determine what to consider in the next steps. Another option is to report the standard errors to create a range around the main I.3 estimate without ISI support.

Box 18. How to proceed when estimated ITE coefficients are non-significant or negative.

In some instances, the evaluation team might have to work with cases where the econometric models yield non-significant or negative coefficients. These cases will not be frequent, but they are not impossible. In both cases, the evaluation team should work closely with the econometrician to ensure the econometric model has been deployed according to the best practices. Then these results must be taken into account in the evaluation process:

Rare case 1: non-significant results

The impact evaluation model might produce a non-significant result. These are the cases where the ITE coefficients are found not to be statistically different from 0, and the evaluator should therefore assume that ITE=0. In this case, the econometric estimates suggest that the considered policy measure, where ITE=0, does not support income. Hence, the process of building the impact indicators without the ISI impact should be interrupted. The values for the impact indicators with and without ISI are the same. The evaluation should proceed but it should integrate qualitative aspects to understand what might be causing the absence of effect or counteracting the expected support impact.

Rare case 2: negative coefficient

The ITE coefficient might be negative. In this case, the results would suggest that the income support caused a net decrease in farm income. This would be possible in contexts where multiple second order adverse effect cancel out the initial impact (for example: increased demand leading to increased input prices, or increased competition leading to lower output prices, etc). It this case, the calculation of netted out impact indicators should proceed. But the resulting indicators without the ISI contribution will be higher than the indicators without.

Source: EU CAP Network supported by the European Evaluation Helpdesk for the CAP (2024

Adjust factor income time series to remove ISI contribution. This is done in a two-part process. First, obtain the estimated ISI contribution to the income factor then remove that contribution from the observed income factor.

The ISI contribution to total income factor is obtained by applying the impact coefficient extracted from the econometric model on the total income support budget expenditure for the corresponding farm group. That contribution is then subtracted from the observed income factor data obtained from Eurostat (or national data sources).

Build adjusted income index and compute percentage deviation from the three year average. These two sub-steps are the same as in Step 1 when computing I.3 with the impact of the support. The factor income level without the support is indexed on a base year, then its annual variation is expressed as a percentage of the moving three year average.

Step 3: Compare the two versions of I.3

The two versions of I.3 can then be compared to assess the impact of the CAP income support on total factor income.

Note again that the steps are the same for I.4 and I.5 with the only difference being the adjustment performed on the FNVA and multiple uses of the impact evaluation model (one with farm types disentangled, one with economic and physical farm sizes, and one by regions).

Figure 11. Components of I.4 and I.5 sub-indicators

I.4	Farm Net Value Added (FNVA), by type of farming						
	FNVA, by region						
	FNVA, by economic farm size						
	FNVA, by physical farm size						
I.5	FNVA, in areas facing natural & other spec. constraints						
	Production value	Intermediary consumption	Depreciation	farm taxes (exc. income taxes)	CAP payments	Subsidies	VAT balance

Direct impact

Source: EU CAP Network supported by the European Evaluation Helpdesk for the CAP (2024)

Illustrative example for the case of Italy

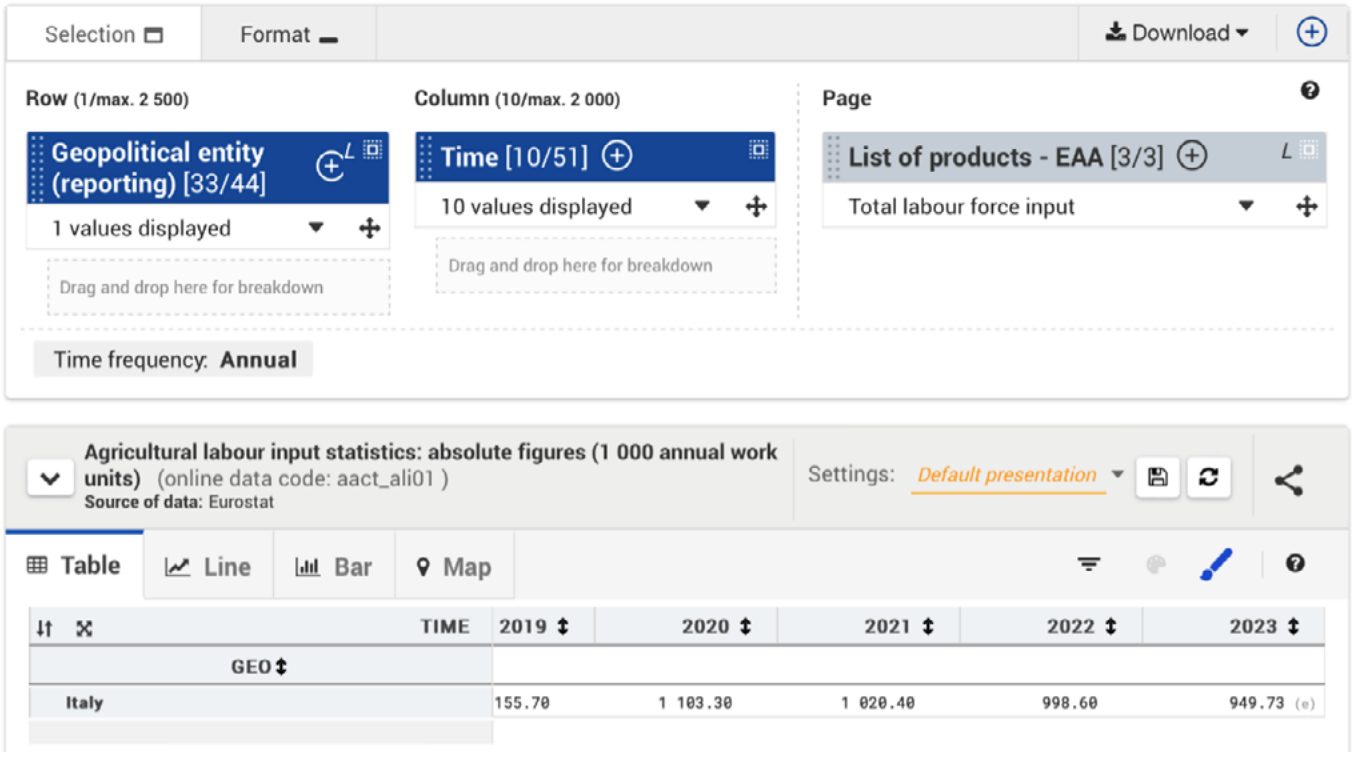
In this section, we apply the suggested methodology on the Italian national income data.

The guidelines use the results of Biagini et al. (2020) [97] outlined in Table 5 of the publication and apply these coefficients on the income data for the Italian sector from Eurostat [98]. The impact evaluation was conducted with data from the previous programming period. Hence, this example uses the same timeframe to build the agricultural factor income index.

Step 1: Compute I.3 with the ISI impact in Italy

Download data from Eurostat. In the Economic Accounts database, we download the factor income for production value at basic prices in Italy.

Figure 12. AWU for Italy from Eurostat

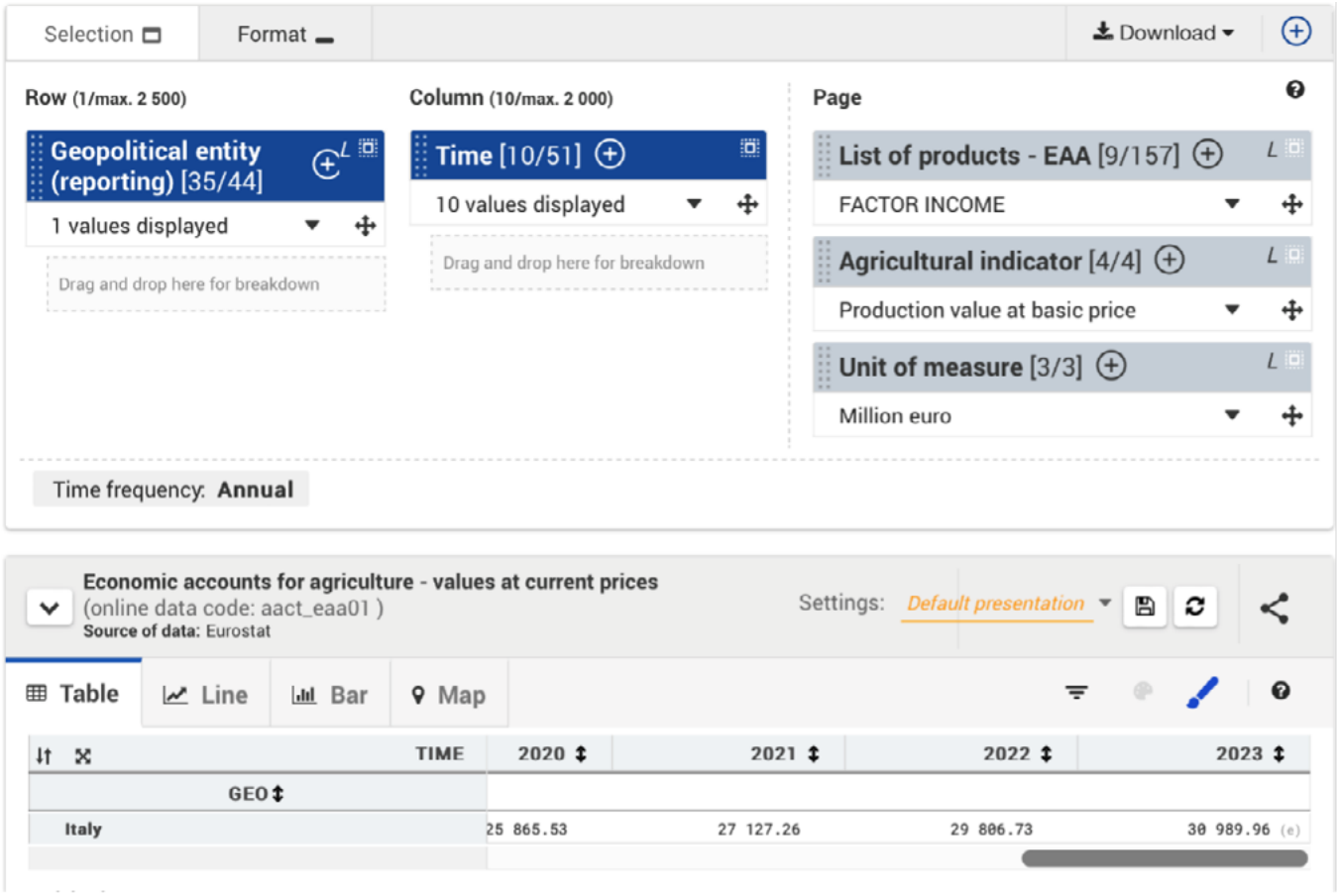


Source: Eurostat

[97] Biagini, L., Antonioli, F., & Severini, S. (2020). The role of the common agricultural policy in enhancing farm income: A dynamic panel analysis accounting for farm size in Italy. Journal of Agricultural Economics, 71(3), 652-675. https://doi.org/10.1111/1477-9552.12383

[98] For more information, see Eurostat's data: https://ec.europa.eu/eurostat/databrowser/view/aact_eaa04/default/table?lang=en

Figure 13. Factor income for Italy in Eurostat



Source: Eurostat

Build factor income time series. In this illustrative case, rely on the ready to use Eurostat factor income aggregate, divided by AWU.

Build factor income index. Factor income per AWU is indexed with 2013 as a base.

Compute the percentage deviation from the three year average (i.e. I.3). After computing the moving three year average, I.3 is obtained from the difference between the index year-on-year change (variation) and the moving average.

Table 13. Computing I.3 for Italy, using Eurostat data

	Factor Income (EUR million)	Total labour force input (1000 AWU)	Factor Income (EUR/AWU)	Index (base 2013)	3-year average	I.3
	A	B	A/B			
2013	27 517.58	1 110.20	24 786	100.0		
2014	25 650.19	1 132.30	22 653	91.4		
2015	25 338.47	1 152.60	21 984	88.7	93.4	
2016	25 398.04	1 184.50	21 442	86.5	88.9	-2.46%
2017	25 416.73	1 159.00	21 930	88.5	87.9	2.2%
2018	27 237.33	1 177.00	23 141	93.4	89.4	5.5%
2019	26 302.6	1 155.70	22 759	91.8	91.2	-1.7%
2020	24 515.77	1 059.30	23 143	93.4	92.9	1.7%
2021	26 041.7	1 041.30	25 009	100.9	95.4	7.9%
2022	28 209.95	1 018.97	27 685	111.7	102.0	10.6%

Source: Eurostat

Step 2: Compute I.3 without the IS impact in Italy

Extract impact coefficients. This illustrative example uses the ITE results of Biagini et al. (2020) [99]. The authors used a SYS-GMM model on a large sample of Italian farms of different sizes and type of farming to estimate the ITE of income support measures of the previous CAP.

It relies on the results of the SYS-GMM model reported in Table 12 by taking an average of the long-run ITE coefficients for coupled direct payments (CDP) and decoupled direct payments (DDP) (0.333 and 0.924) for the total sample. This yields an arithmetic mean of 0.6285. It could be possible to calculate an average value taking into account the relative importance of the support from the two instruments, provided that the shares differ. Indeed, for a sounder evaluation, it would be better not to take the average, but to collect enough data to do the calculations separately for CDP and DDP.

The rationale for using these two measures only (CDP and DDP) is that they most resemble the ISI from the previous programming period.

Another relevant example could be found in the work of Ciliberti et al. (2022) [100]. That paper used a Quantile Continuous Treatment Effect model to estimate the ITE in the Italian agricultural sector. However, it refers only to DDP and 'Type of Farming 1' (specialised field crop farms). In contrast, Biagini et al. (2020) covers the impact of both DDP and CDP for all types of farming in Italy.

[99] Biagini, L., Antonioli, F., & Severini, S. (2020). The role of the common agricultural policy in enhancing farm income: A dynamic panel analysis accounting for farm size in Italy. Journal of Agricultural Economics, 71(3), 652-675. https://onlinelibrary.wiley.com/doi/10.1111/1477-9552.12383

[100] Ciliberti, S., Severini, S., Ranalli, M. G., Biagini, L., & Frascarelli, A. (2022). Do direct payments efficiently support incomes of small and large farms? European Review of Agricultural Economics, 49(4), 796-831. https://doi.org/10.1093/erae/jbac013

Table 14. Income Transfer Efficiency results of Biagini et al., (2020)

Short- and long-run income effects of CAP measures from SYS-GMM estimation (total sample and small, medium and large farm subsample models)				
	Total	Small	Medium	Large
Short-run				
CDP	0.261	-0.089	1.194	0.193
DDP	0.725***	0.781**	0.531**	0.668***
RDP_{aes}	0.403**	0.159	0.087	0.478
RDP_{inv}	0.369***	0.014	0.424***	0.514***
RDP_{other}	1.235***	0.848**	1.266***	1.558***
Long-run				
CDP	0.333	-0.097	1.284	0.246
DDP	0.924***	0.858**	0.571**	0.852***
RDP_{aes}	0.514**	0.175	0.093	0.610*
RDP_{inv}	0.470***	0.015	0.456***	0.655***
RDP_{other}	1.575***	0.931**	1.362***	1.987***

Note: Significance codes for P-values: ***≤ 0.01; **≤0.05; *≤0.01
Source: Authors' elaboration on Italian FADN data

This illustrative example relies only on aggregated figure from Eurostat (a single total income factor for the sector).

Adjust factor income time series to remove ISI contribution. Use the income support data from the Agri data portal [101] to get the total budget expenditure and multiply by the ITE coefficient. That yields the factor income attributed to the support. Then remove that amount from the total observed income support.

Build adjusted income index and compute the percentage deviation from the three year average. These two sub-steps are preformed similarly to Step 2.

[101] For more information, see: https://agridata.ec.europa.eu/extensions/DashboardIndicators/FarmIncome.html

Table 15. Computing I.3 without income support for Italy, using Eurostat data

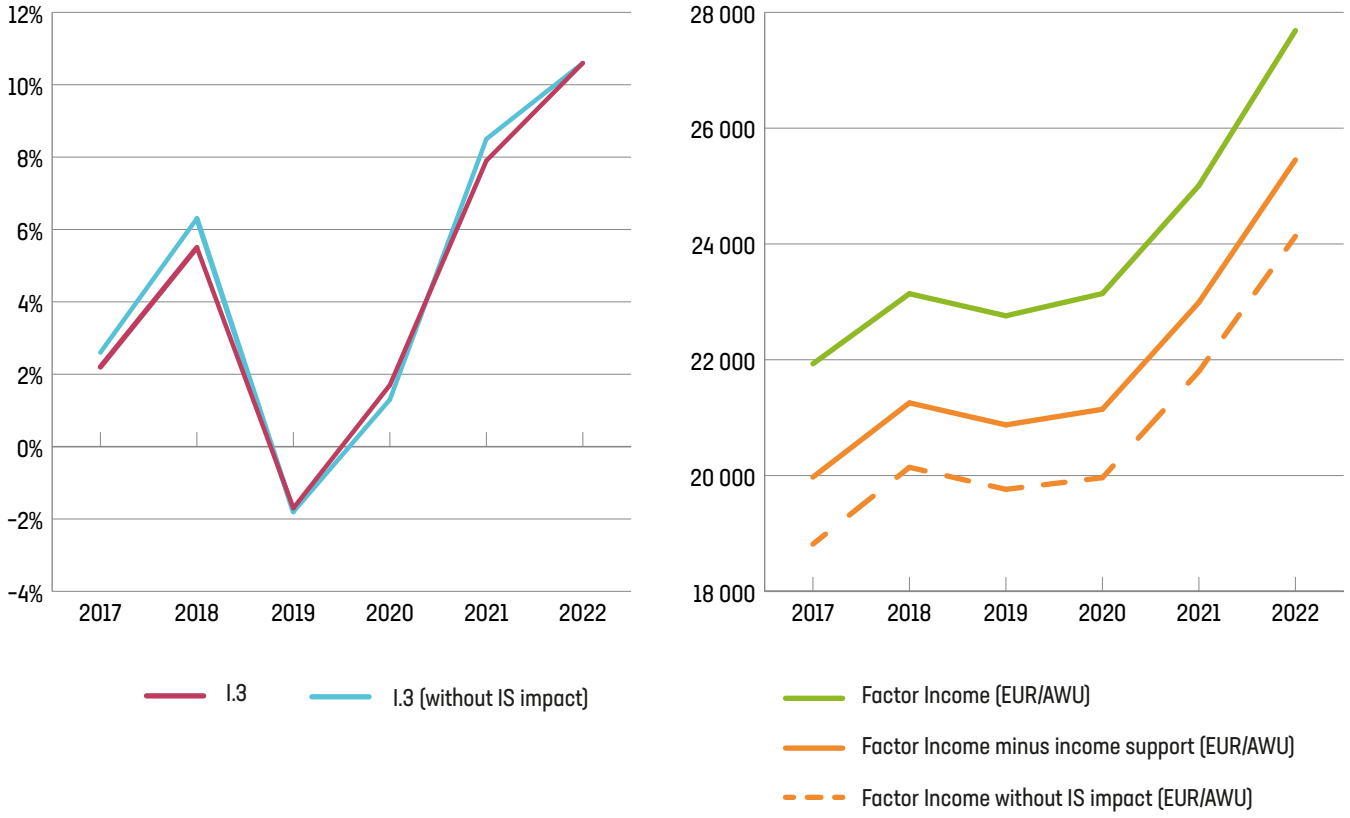
	Factor Income (EUR million)	Share of direct support in agricultural income	Income support	ITE	Income support impact	Factor income without income support	Factor income without income support impact	Total labour force input (1000 AWU)	Factor Income minus income support (EUR/ AWU)	Factor Income without IS impact (EUR/ AWU)	Index (base 2013)	3-year average	I.3 (without IS impact)
	A	B	C = A*B	D	E = C*D	F1 = A-C	F2 = A-E	G	F1/G	F2/G			
2013	27 518	14.44%	3 974	0.629	2 497	23 544	25 020	1 110	21 207	22 537	100.0		
2014	25 650	15.43%	3 958	0.629	2 487	21 692	23 163	1 132	19 158	20 456	90.8		
2015	25 338	15.13%	3 834	0.629	2 409	21 505	22 929	1 153	18 658	19 893	88.3	93.0	
2016	25 398	14.77%	3 751	0.629	2 358	21 647	23 040	1 185	18 275	19 452	86.3	88.5	-2.2%
2017	25 417	14.20%	3 609	0.629	2 268	21 808	23 148	1 159	18 816	19 973	88.6	87.7	2.6%
2018	27 237	12.96%	3 530	0.629	2 219	23 707	25 019	1 177	20 142	21 256	94.3	89.8	6.3%
2019	26 303	13.17%	3 464	0.629	2 177	22 839	24 125	1 156	19 762	20 875	92.6	91.9	-1.8%
2020	24 516	13.74%	3 368	0.629	2 117	21 147	22 399	1 059	19 963	21 145	93.8	93.6	1.3%
2021	26 042	12.83%	3 341	0.629	2 100	22 701	23 942	1 041	21 800	22 992	102.0	96.2	8.5%
2022	28 210	12.83%	3 619	0.629	2 275	24 591	25 935	1 019	24 133	25 452	112.9	102.9	10.6%

Source: Eurostat

Step 3: compare the two versions of I.3 in Italy

Finally, compare the two versions of I.3 (with and without income support) to conclude that, under the many assumptions described above, income support has a positive net impact on factor income.

Figure 14. I.3 with and without income support in Italy, rough illustration



Source: EU CAP Network supported by the European Evaluation Helpdesk for the CAP (2024)

Note that the I.3 indicator without ISI chart line (orange) seems to vary more than the I.3 with ISI (blue), but this should not be interpreted as a policy impact. It is due to the base differential between the two lines (the three year averages).

3.3.2. Netting out I.2 with the results of the model

The I.2 indicator is made of three sub-indicators:

1. Agricultural entrepreneurial income plus compensation of employees per AWU.
2. Farm net income plus wages and social security charges by total AWU.
3. Farm net income minus opportunity costs for own production factors (land and capital) by total family work units.

The first one (entrepreneurial income) is built from the factor income adjusted for rent and interests. Entrepreneurial income is then combined with employee compensation to reflect the compensation for all types of work. The second sub-indicator builds on farm net income which is obtained from the FNVA, from which wages, rent, social security charges and interests are subtracted. To get a depiction of all work performed, wages and social security charges are added back. Finally, the third sub-indicator also starts with farm net income, from which opportunity cost for own production factors are subtracted. This is an indicator relevant for farms with family labour.

Point of attention: All three sub-indicators include an income component (factor income or FNVA) and other components that are endogenous to income (e.g. rents, interest wages, social security, etc.), i.e. the relationship is bidirectional (higher income might translated in higher wage, but higher wages might also lower the income).

Ideally, each sub-indicator will have been calculated for each farm of the data sample and set as a dependent variable in the econometric model. The model will have included adequate components to address the endogeneity issues. If that is the case, the evaluator can safely use the ITE estimates to directly adjust each sub-indicators according to the amount of support.

Not computing the sub-indicators for each farm and using farm income or FNVA directly in the econometric model will produce a coefficient that cannot be directly applied to the full I.2 sub-indicators, but only to their income or FNVA component. Leaving the other components untouched might lead to over or underestimation of the impact of income support.

Step 1: Compute the three sub-indicators of I.2

I.2 is made of three sub-indicators, as illustrated in the figure below.

Figure 15. Components I.2 sub-indicators

I.2	**Agricultural entrepreneurial income plus compensation of employees per AWU**		
	Factor income	Rents	Net interest
	Direct impact		
	Farm Net Value Added (FNVA), by economic farm size		
	FNVA	Wage	Social security charges
	Direct impact		
	Farm net income minus opportunity costs for own production factors (land and capital) by total family work unit		
	FNVA	Opportunity costs for land	Opportunity costs for capital
	Direct impact		

Source: EU CAP Network supported by the European Evaluation Helpdesk for the CAP (2024)

The data to compute each item at aggregated level is listed in the guidance note on PMEF indicators [102].

The evaluator should also compute the sub-indicators at farm level, based on data from FADN. The sub-components (e.g. rents, net interest, wages, etc.) should be collected for each farm of the sample and added or subtracted from factor income or FNVA.

Step 2: Compute I.2 sub-indicators without the impact of income support

- Extract ITE for ISI. The underpinning impact evaluation model to use is the same for I.3, I.4 and I.5 indicators.
- Use the coefficient(s) to modify the three I.2 sub-indicators. Multiply the income support amount by the ITE coefficient. Subtract the resulting figure from the sub-indicators.
- Compare the sub-indicators with and without the adjusted income.

Concluding remarks

This section outlined the general steps to net out the impact of income support on the impact indicators I.2 to I.5, and an illustrative example was provided for I.3. It was not possible to prepare an illustrative example for the other indicators as this requires fresh econometric modelling tailored to these indicators.

[102] For more information, see: https://agriculture.ec.europa.eu/common-agricultural-policy/cap-overview/cmef_en#towardsthepmef

4. Annex I – Relevant PMEF indicators for assessing CAP income support interventions

The following table presents the main evaluation elements to assess the effectiveness of CAP income support interventions under the key element 'viable farm income'.

Evaluation sub-questions	Judgement criteria/ Factors of success	PMEF indicators	Data sources
1.1. Viable farm income: **To what extent have CSP interventions ensured viable farm income?**	1.1.1 Agricultural income level in farms supported is increasing. 1.1.2 Variability of agricultural income level is decreasing.	**Output** › Number of hectares benefitting from basic income support (O.4) › Number of beneficiaries or hectares benefitting from payments for small farmers (O.5) › Number of hectares benefitting from complementary income support for young farmers (O.6) › Number of hectares benefitting from redistributive income support (O.7) › Number of hectares/Number of heads benefitting from coupled income support (O.10-O.11) › Number of hectares benefitting from support for areas facing natural or other specific constraints (O.12) › Number of hectares benefitting from support under Natura 2000 or Directive 2000/60/EC (O.13) **Impact** › Percentage variation of the index of agricultural factor income per AWU compared to the last three year average (I.3) › Comparison of average percentage change of agricultural factor income per AWU between 2014-2022 and 2023-2027 programming periods across Member States (calculation based on C.25.1) › Agricultural holdings (C.12) › Farm labour force (C.13) › Utilised agricultural area (C.17)	› CAP indicators and data explorer › Data for monitoring and evaluation › Eurostat › FADN/FSDN

Evaluation sub-questions	Judgement criteria/ Factors of success	PMEF indicators	Data sources
	1.1.3 Income disparities between the farming sector and other economic sectors are decreasing.	**Output** › Number of hectares benefitting from basic income support (O.4) › Number of beneficiaries or hectares benefitting from payments for small farmers (O.5) › Number of hectares benefitting from complementary income support for young farmers (O.6) › Number of hectares benefitting from redistributive income support (O.7) › Number of hectares/Number of heads benefitting from coupled income support (O.10-O.11) › Number of hectares benefitting from support for areas facing natural or other specific constraints (O.12) › Number of hectares benefitting from support under Natura 2000 or Directive 2000/60/EC (O.13) **Impact** › Evolution of agricultural income compared to average income in the economy (I.2) **Context** › Agricultural holdings (C.12) › Utilised agricultural area (C.17) › Comparison of agricultural income with non-agricultural labour costs (C.26)	› Eurostat › CAP indicators and data explorer › Data for monitoring and evaluation

Evaluation sub-questions	Judgement criteria/ Factors of success	PMEF indicators	Data sources
	1.1.4 Income disparities among farms and territories are decreasing.	**Output** › Number of beneficiaries or hectares benefitting from payment for small farmers (O.5) › Number of hectares benefitting from redistributive income support (O.7) › Number of hectares benefitting from support for areas facing natural or specific constraints, including a breakdown per type of areas (O.12) › Number of hectares benefitting from support under Natura 2000 or Directive 2000/60/EC (O.13) › Result variable R004 (Annex IV, Commission Implementing Regulation (EU) 2022/1475) **Result** › Percentage of additional direct payments per hectare for eligible farms below average farm size (compared to average) (R.6) › Percentage of additional support per hectare in areas with higher needs (compared to average (R.7) **Impact** › Evolution of agricultural income level by type of farming compared to the average in agriculture (I.4) › Evolution of agricultural income in areas with natural constraints compared to average agricultural income (I.5) **Context** › Farming in Natura 2000 areas (C.19) › Areas facing natural and other specific constraints (C.20) › Farm income by type of farming, region, farm size, in areas facing natural or specific constraints (C.27)	› CAP indicators and data explorer › Data for monitoring and evaluation › CAP Strategic Plans › FADN/FSDN

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European Evaluation Helpdesk for the CAP
Rue Belliard 12, 1040
Brussels, Belgium
+32 2 808 10 24
evaluation@eucapnetwork.eu

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