



Università degli Studi della Tuscia di Viterbo

Dipartimento di economia, ingegneria, società e impresa

Corso di Dottorato di Ricerca in

**Economia, Management e Metodi Quantitativi (EMMQ)
Curriculum: Economia e Politica Agro-Alimentare XXXIV ciclo**

TESI DI DOTTORATO DI RICERCA

**Investigating social preferences on the agri-food environmental sustainability:
an assessment based on stated preference methods**

s.s.d. AGR/01

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A.A. 2020/21 (A.Y. 2020/21)

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Abstract

The agricultural sector has come under intense pressure in recent decades. Intensive production systems, developed by the need to feed the growing world population, act at the same time overexploitation of natural resources and a loss of ecosystem services. Community attention to human activities' impacts on natural capital is growing. This awareness has translated, on the one hand, into higher pressure on policymakers to support agricultural systems' transition towards sustainability and, on the other, into higher demand for sustainable agri-food products. Both paths start with production systems implementing more sustainable agricultural practices. The policies, through tools development, try to support producers' efforts in implementing these changes. In this work, the Good Agricultural Environmental Conditions provided by the new CAP 23-27 reform will be analyzed. This tool aim to push the transition of agricultural systems towards sustainability.

The market accepted this challenge by trying to make not only the single processes but the supply chains completely sustainable.

In this perspective, this Ph.D. research aims to understand the hypothetical value that individuals, in their dual nature of citizen and consumer, attribute to ecosystem services flows, generated by more sustainable agricultural systems and transmitted, through sustainability attribute, in an agri-food product. The topic is addressed by declining the evaluation in two different approaches, to provide a more detailed discussion and investigate individuals' preferences in their dual roles.

Using techniques based on stated preference methods, respondents' willingness to pay assessment will be provided for a public and a private good.

Given the breadth of the topic investigated, the environmental assessment, this work aims to contribute, through elements of originality, to broaden some research areas on this topic, such as the evaluation of political tools and consumer preferences for actions/attributes aimed at increasing/communicating the efforts of the agricultural sector towards sustainability.

1. CHAPTER 1

1.1. Introduction¹

Il rapporto uomo-natura manifesta nella gestione delle produzioni agricole un esempio concreto di evoluzione e gestione delle attività antropiche direttamente vincolata a cicli bio-geochimici e di capacità di rigenerazione degli ecosistemi.

Negli ultimi 100 anni la produzione di materie prime da parte del settore agricolo ha risentito dell'impostazione lineare dei modelli di produzione industriale, migliorando da un lato la capacità del sistema di rispondere ai fabbisogni alimentari in gran parte del pianeta e dall'altro incidendo fortemente sugli equilibri degli ecosistemi a diverse scale (Godfray et al., 2010; Tilman et al., 2011; Trewavas, 2002; Tschamntke et al., 2005). L'agricoltura intensiva, basata principalmente su monocoltura, utilizzo di input chimici e alta meccanizzazione ha infatti provocato progressivamente danni all'ambiente (Balbi et al., 2015; FAO, 2007; Huang et al., 2015; Kleijn et al., 2009; Vermeulen et al., 2012). Degradazione dei suoli, perdita di fertilità e biodiversità, inquinamento delle acque e alte emissioni di CO₂ sono solo alcune delle esternalità negative prodotte da questa gestione dei sistemi produttivi (Canovas et al., 2018; Bardgett and van der Putten, 2014; Pe'er et al., 2014; Plue et al., 2018). Il sovrasfruttamento delle risorse naturali da parte del settore agricolo ha compromesso la capacità di fornitura dei Servizi Ecosistemici – ESs (Dale and Polasky, 2007). I servizi ecosistemici, come sappiamo, nella classificazione più comune identificata nel MEA (2005) e ripresa da Power (2010), svolgono servizi di supporto, approvvigionamento, regolazione e valori culturali. Il genere umano fruisce più o meno direttamente di tali benefici prodotti dagli ecosistemi. Per tale motivazione negli anni società e istituzioni hanno investito nel migliorare la capacità di analisi degli effetti di questa intensificazione agricola, considerando non solo i benefici ma anche i costi connessi a questo modello di produzione. Tutto ciò ha determinato una progressiva presa di coscienza da parte della collettività, che mostra sempre più interesse per il tema ambientale. Anche per mezzo dell'attenzione data al verificarsi di eventi catastrofici legati al problema dei cambiamenti climatici, il dibattito sulla transizione ecologica ha raggiunto un numero crescente di persone. ONG e gruppi organizzati di consumatori/cittadini, specialmente in occidente, hanno quindi esercitato pressioni sui governi e sui mercati chiedendo anche al sistema agricolo di modificare i processi produttivi (Krug et al., 2020). La società sta chiedendo al settore agricolo di ridurre gli impatti sulle risorse naturali (Brindley and Oxborrow, 2014; Pretty, 2018). A queste richieste cercano di rispondere i policy maker attraverso

¹ La presente tesi si struttura attraverso la trattazione in lingua italiana del capitolo introduttivo e conclusivo, mentre i due casi studio verranno discussi in lingua inglese poiché restituiscono le analisi di due differenti pubblicazioni scientifiche in corso di submission a rivista internazionale.

politiche che incentivino un'intensificazione sostenibile dei sistemi agricoli (Garnett et al. 2013; Foley et al., 2011; Rey Benayas and Bullock, 2012; Tilman et al., 2011). Sono stati sviluppati a tal proposito strumenti che supportano gli agricoltori nell'adozione di pratiche agricole basate sui principi dell'agroecologia, dell'agricoltura biologica/diversificata (Altieri and Nicholls, 2005; Benitez-Altuna et al., 2021; FAO, 2018).

Questi modelli non solo mirano a ridurre le esternalità negative, ovvero l'uso non sostenibile delle risorse naturali, ma sempre di più vengono reputati capaci di migliorare la capacità produttiva dei sistemi agricoli rendendoli allo stesso tempo produttori di esternalità positive.

Secondo la recente letteratura sviluppata nell'ambito del dibattito dell'economia ecologica, tali sistemi agro-ecologici sarebbero in grado di incrementare la disponibilità di molti servizi eco-sistemici. Gli agroecosistemi sono produttori di benefici per la società, contribuendo in diverse forme al benessere umano (Costanza et al., 1997; Ehrlich et al., 1977). Nel processo di produzione agricola sono coinvolti processi e servizi ecosistemici che con il loro funzionamento mettono a disposizione della comunità beni (cibo, materie prime...) e servizi in grado di soddisfare le esigenze dirette e indirette degli esseri umani (de Groot, 1992).

Oltre che verso l'esterno i servizi agro-ecosistemici sono artefici di un miglioramento dei fattori produttivi "latenti" interessati dai processi di produzione agricola. La produttività agricola è influenzata dalla qualità delle acque, dalla fertilità dei suoli, dalla biodiversità, ovvero un sistema resiliente, ispirato a logiche sistemiche e agro-ecologiche, soffre meno rispetto a shock dovuti a mutamenti del clima o altri fattori di disturbo.

Ciò considerato, nel contesto europeo politiche come la PAC hanno riconosciuto questo percorso come valido e da tempo risposto alle istanze di sempre più ampi gruppi di cittadini più sensibili alla tematica ambientale. Negli anni ha previsto una serie di strumenti in grado di coprire temi trasversali come la sicurezza alimentare, la qualità degli alimenti, il sostegno al settore agricolo, i cambiamenti climatici e la tutela del capitale naturale. Anche l'ultima riforma percorre la sfida alla transizione sostenibile del settore agricolo, in piena armonia con quanto proposto nelle diverse comunicazioni della Commissione Europea in tema di Green Deal (Cesaretti et al., 2011; European Commission, 2018a; Feindt, 2010; Prager et al., 2012).

Oltre all'interesse del pubblico, la tensione ambientale ha stimolato anche nel mercato meccanismi di revisione dei processi di produzione e approvvigionamento delle materie prime nella logica di qualificare prodotti "sostenibili" e catturare l'interesse e la disponibilità a pagare dei consumatori. Alcune filiere stanno cercando di differenziare i loro prodotti, non solo destinati a mercati di nicchia ma anche per prodotti di largo consumo generati da commodities in contesti di filiere globali,

dimostrando nei fatti che la leva della sostenibilità sta diventando un asset per molti gruppi dell'industria agroalimentare (Seuring, 2011).

In questo quadro, con il presente lavoro si vuole analizzare la riconoscibilità da parte degli individui dei benefici ambientali che gli agro-ecosistemi producono fornendo anche una stima in termini economici del valore che gli attribuiscono.

1.2.Environment valuation: concepts and challenges

1.2.1. Environmental assessment: debate on agricultural sustainability

La società chiede al settore agricolo di accettare la sfida della sostenibilità, ma non è chiaro se questo aumento di servizi ecosistemici e dunque di benessere, possa in qualche modo tradursi in una compensazione dei mancati ricavi o maggiori costi per i principali attori coinvolti, agricoltori in primis. Gli individui nel manifestare le loro richieste agiscono con una duplice natura. In veste di cittadini richiedendo ai decisori politici di interessarsi maggiormente alla tutela dell'ambiente, promuovendo strumenti efficaci per l'implementazione di pratiche agricole più sostenibili (Dupras et al., 2017; Grilli et al., 2018; Horlings and Marsden, 2011; Novikova et al., 2017). In veste di consumatori esercitando pressioni sul mercato, ricercando attributi di sostenibilità sui prodotti agroalimentari. La domanda crescente di questi prodotti comporta l'esigenza di produrre materie prime diverse in cui la sostenibilità è una delle caratteristiche principali.

L'implementazione di pratiche agricole più sostenibili è alla base di tutti questi processi e implica spesso una modifica nei sistemi di produzione. Gli sforzi sostenuti dai produttori agricoli per l'implementazione di tali pratiche sono in parte supportate dalle politiche e in parte dal mercato. L'Agenda 2030 delle Nazioni Unite ha segnato il percorso verso la sostenibilità tramite la definizione degli Obiettivi di Sviluppo Sostenibile. I policy maker di governi nazionali e sovranazionali stanno cercando di integrare queste richieste all'interno delle proprie strategie politiche. L'Unione Europea nella riforma della PAC rafforza la propria architettura verde in nome della sostenibilità. La relazione tra sistemi di produzione agricola, ambiente e protezione del capitale naturale è il cuore della riforma. La PAC vuole giustificare l'impegno del sostegno agli agricoltori con l'obiettivo di preservare il benessere dei cittadini. Il rafforzamento del patto sociale tra agricoltura e società è esplicitamente citato nel 9° obiettivo degli "Obiettivi Chiave" (European Commission, 2018b).

Tale processo di trasformazione sta interessando anche il mercato. Il settore dell'agro-alimentare cerca di soddisfare la richiesta di prodotti, anche di largo consumo, attenti all'ambiente affrontando una sfida più grande, ossia rendere sostenibile l'intera filiera e non solo un singolo processo. Questo sta avvenendo in alcuni rami dell'agro-alimentare dove la collaborazione tra gli stakeholder principali (produttori, industria, fornitori) con esperti, ONG, istituti di ricerca e Università sta producendo

radicali cambiamenti nelle filiere (Chkanikova and Lehner, 2015; Jones et al., 2008; Sacchi et al., 2018).

In questo quadro è quindi importante chiedersi se la collettività è consapevole del legame esistente tra l'implementazione di modelli di produzione di materie prime sostenibili e il valore, per quanto ipotetico, generato dai benefici di questa transizione.

Indagare in questo campo è necessario per misurare quali sono i benefici maggiormente ricercati dagli individui e, perciò, che potrebbero apportare maggiore utilità al loro benessere.

Economisti ed ecologisti sin dagli anni '80 dibattono sull'importanza di identificare una corretta attribuzione di valore ai benefici della natura, affinché questi siano tenuti maggiormente in considerazione nelle fasi di programmazione dei processi di produzione (Ehrlich et al. 1977; Costanza et al., 1997).

Nel tempo sono state sviluppate diverse metodologie per poter effettuare valutazioni monetarie su beni e servizi che non possono essere scambiati nel mercato.

Nello specifico Valutazioni Non di Mercato (NMV) basate sulle Revealed Preferences (RP), sulle Stated Preference (SP) oppure approcci basati sui costi o sul fattore reddito. Tecniche di RP, come Hedonic wage method o Averted expenditures, ricavano la disponibilità a pagare direttamente dall'analisi di comportamenti reali degli individui. Nei metodi delle SP, come i Discrete Choice Experiments (CE) o la Contingent Valuation (CV), al contrario di quelli appena elencati, si stimano dei valori a partire dalle scelte che gli intervistati compiono in scenari ipotetici ma realistici. Questa caratteristica permette di valutare dei beni/servizi aggirando il problema dell'inesistenza di un mercato reale. Tale aspetto riflette anche uno dei punti di debolezza di queste metodologie, il cosiddetto Hypothetical Bias (HB). Il HB viene definito come la deviazione che si genera, in misura aggregata o disaggregata, per il fatto che la raccolta dati viene effettuata non in un contesto reale ma ipotetico (Haghani et al., 2021a). Per mitigare tale effetto possono essere applicati diversi metodi, sia ex-ante o ex-post. Haghani et al. (2021b) effettua una rassegna delle principali azioni che in letteratura sono state riconosciute come valide per contrastare le fonti intrinseche di HB, come il cheap talk, il solmen oath oppure il RP-assisted estimations.

In campi come l'agro-ecologia, economia ecologica, politica agraria è importante per stimare il valore attribuito a potenziali opzioni di gestione, strumenti politici e una chiave di lettura obiettiva delle considerazioni degli intervistati riguardo un tema specifico (Alcon et al., 2020; Barkmann et al., 2008; Chee, 2004; García-Llorente et al., 2012; Latvala et al., 2021; Martínez-Paz and Perni, 2011; Swinton et al., 2007; Turner et al., 2010). Nella contingent valuation agli individui viene chiesto di esprimere, in modo ipotetico, delle valutazioni riguardanti la disponibilità a pagare. Il questionario delinea uno specifico mercato ipotetico da cui si eliciteranno i valori della WTP per determinati beni/servizi

(Carson, 2000; Louviere and Hensher, 1982). Nel Choice Experiment agli intervistati vengono presentati dei set di scelta composti da più alternative, anch'esse ipotetiche, tra cui scegliere. Le alternative sono costruite attraverso la combinazione degli attributi del bene che si vuole analizzare, suddiviso in diversi livelli. Nell'analisi dei servizi ecosistemi, grazie a questa metodologia, oltre alle valutazioni complessive di tutti gli ES forniti da un agroecosistema è possibile analizzare ogni singolo servizio singolarmente.

Uno dei limiti di tale approccio è che questi strumenti non sempre sono adeguati a rappresentare delle buone approssimazioni di preferenza su tematiche spesso troppo distanti dal vissuto di un numero sempre maggiore di individui.

I benefici prodotti dagli agro-ecosistemi sono beni non di mercato e nelle stime costo-opportunità spesso non vengono analizzati con il loro completo valore. In alcuni casi la mancata valutazione si traduce implicitamente in un valore zero (Costanza et al., 1997; Daily, 1997; de Groot et al., 2010; García-Llorente et al., 2012). Nel caso dei servizi ecosistemici legati al settore agricolo una negligenza del genere può apportare significativi danni all'ambiente. Nelle valutazioni bisogna tenere conto che gli ESs sono strettamente legati al contesto e all'area geografica di riferimento sia per le quantità potenzialmente prodotte sia per il valore che i cittadini e gli stakeholder gli attribuiscono (Castro et al., 2011; Díaz et al., 2006; Hein et al. 2006).

Se nelle analisi si considera il valore economico dei servizi ecosistemici in base ai beneficiari, bisogna tenere conto che la quantità domandata per un particolare ES potrebbe non corrispondere alle reali capacità di offerta dell'agroecosistema interessato (Villamagna et al., 2013). Il rischio è che tali approssimazioni, sottostimate o sovrastimate, generino nell'opinione pubblica e nelle decisioni politiche considerazioni errate rispetto al reale valore dei benefici apportati dai flussi di ESs (Loomis et al., 2000).

1.2.2. A social preferences assessment on agricultural sustainability

Come si apprende dalla letteratura negli anni sono stati sviluppati numerosi studi sulla valutazione del valore ambientale basati su diversi approcci. Gli studi degli individui analizzano gli esseri umani sia come parte della società, quindi in veste di cittadini, che come attori del mercato, quindi come consumatori. Queste valutazioni, a seconda della metodologia che implementano, possono essere indirizzate su aspetti ambientali più o meno specifici. Inoltre, le stime sono influenzate da differenti variabili, tra cui il contesto geografico preso in esame, le caratteristiche socio-demografiche e la sensibilità dell'individuo alle tematiche ambientali. Visto l'ampio contesto di analisi la letteratura presenta diversi ambiti di analisi che ancora non sono stati pienamente indagati.

Il presente lavoro si vuole inserire in questo quadro analizzando nello specifico le valutazioni degli individui rispetto alle interconnessioni che vi sono tra la transizione a sistemi di gestione degli agro-ecosistemi più sostenibili e il benessere della società.

Il tema viene affrontato declinando la valutazione in due differenti approcci con degli elementi di originalità che si vogliono aggiungere alla ricerca già presente in letteratura.

Attraverso delle tecniche basate su metodi SP verranno analizzati il valore ipotetico attribuito ad un bene pubblico (servizi ecosistemici derivanti da agroecosistemi più sostenibili) e quello riconosciuto ad un bene privato (prodotto agroalimentare con attributo di sostenibilità).

L'analisi si basa su delle valutazioni effettuate dallo stesso campione di persone che rispondono in una duplice veste, di cittadino prima e consumatore poi. L'originalità di questo approccio, permesso dalle metodologie SP, tenta di fornire un quadro quanto più completo delle considerazioni che gli individui hanno rispetto ai possibili benefici che possono derivare dalla transizione a sistemi agricoli più sostenibili.

La declinazione dei due temi parte dalla stima del valore attribuito ad un bene pubblico.

Le valutazioni si basano sull'analisi dei servizi ecosistemici forniti alla collettività da una gestione più sostenibile degli agro-ecosistemi.

Nello specifico i sistemi produttivi in questione sono conformi alle linee guida previste dalle Good Agricultural Environmental Conditions (GAEC). Questo strumento, riformulato e parte della condizionalità rafforzata della nuova riforma PAC (21-27), definisce degli standard minimi per rispondere a sfide importanti quali la lotta ai cambiamenti climatici, la perdita di biodiversità, il degrado dei suoli e la qualità dei sistemi idrici. L'implementazione delle GAEC, all'interno dei sistemi agricoli europei, agisce sulle capacità degli agro-ecosistemi di fornire diversi tipi di ESs.

L'analisi mira a comprendere la disponibilità a pagare degli individui, in veste di cittadini, per ottenere questi miglioramenti ambientali e fruire di quantità maggiori di determinati servizi eco-sistemici che si traduce in benessere per la società.

L'originalità del presente lavoro consiste nell'affrontare la valutazione degli ESs potenzialmente forniti da pratiche agricole più sostenibili utilizzando esperimenti di scelta. Ciò consente di valutare sia il contributo complessivo di questi strumenti della nuova PAC (GAEC) al benessere umano che i benefici forniti dai singoli ESs generati da questa gestione degli agroecosistemi.

L'utilizzo di un Choice Experiment ci permette di definire uno scenario ipotetico, ma perfettamente realistico, declinato secondo i diversi tipi e livelli degli ESs interessati dalle linee guida delle nuove GAEC.

Nell'indagine non si fa diretto riferimento ai tecnicismi di tipo procedurale della PAC. I cittadini potrebbero non essere a conoscenza del tema, rimanere riluttanti a esprimere un'opinione obiettiva per una tematica molto di nicchia o dare risposte strumentali o di protesta relativamente ai sussidi percepiti dagli agricoltori grazie a questa politica. L'obiettivo dello studio è quello di ampliare la conoscenza della valutazione sui flussi di ESs da parte della collettività fornendo una valutazione indipendente della questione della PAC.

Indagare sul valore che la società attribuisce ai benefici che l'ambiente fornisce è fondamentale in un'ottica politica. La stima in termini economici dei potenziali scenari, ottenibili tramite l'implementazione di questo strumento, mira a fornire ai policy maker un feedback quantitativo e uno strumento di valutazione oggettiva del valore che i cittadini attribuiscono a questo tipo di politiche. Tali valutazioni possono essere utilizzate per progettare strumenti, sostegni e normative in grado di aumentare il reale benessere della società. Inoltre, l'entità del valore attribuito dai cittadini potrà fornire indicazioni circa l'implicita accettazione, o non accettazione, da parte del cittadino dell'utilizzo dei fondi del bilancio EU che vengono veicolati attraverso la PAC agli agricoltori con l'obiettivo del raggiungimento della sostenibilità, così come presente nell'ultima proposta di riforma. Questo spinge un'ulteriore valutazione rispetto all'ammontare del sostegno che viene elargito ai produttori europei, sotto forma di pagamenti diretti del primo pilastro, per l'implementazione di tali pratiche.

Una volta identificata la disponibilità a pagare del cittadino per i servizi connessi all'implementazione delle GAEC proposte nella nuova PAC, l'analisi continua portando l'interlocutore ad esprimere valutazioni più specifiche riguardo alla sua disponibilità a pagare per prodotti più sostenibili.

Il focus dell'analisi si sposta dal valore attribuito alla natura, servizi ecosistemici (bene pubblico) a quello derivato dall'ipotetica disponibilità a pagare per un prodotto tangibile (bene privato) caratterizzato come sostenibile. Gli agro-ecosistemi di riferimento sono sempre conformi alle pratiche previste dalle nuove GAEC ma in questo caso cambia l'oggetto delle analisi e il ruolo dell'individuo che diventa un attore del mercato.

In questo contesto l'obiettivo è quello di indagare la disponibilità a pagare dell'individuo, in questo caso in veste di consumatore, per prodotti agroalimentari di largo consumo e a basso valore aggiunto con attributi di sostenibilità, nello specifico la pasta. Questa scelta è stata effettuata poiché la superficie degli agrosistemi oggetto di analisi era principalmente gestita a seminativo, la cui coltivazione principale negli avvicendamenti annuali era di frumento duro/tenero.

In questo quadro le analisi si sono sviluppate indagando l'influenza che alcuni fattori possono avere sul valore ipotetico che i consumatori sono disposti a pagare per pasta prodotta con materie prime, frumento duro, provenienti da sistemi agricoli più sostenibili.

Anche in questo caso l'utilizzo di un metodo SP, una contingent valuation, ha permesso di costruire il mercato ipotetico, ma realistico, in cui l'individuo dichiarava le proprie preferenze.

Da questo è stato possibile comprendere se esistono e quali sono i fattori che possono determinare una maggiore disponibilità a pagare per un pacchetto di pasta con queste caratteristiche. Nello specifico è stato analizzato il peso che le attitudini ambientali possono avere nell'influenzare tale stima.

In letteratura pochi lavori hanno come obiettivo la valutazione della riconoscibilità di un maggior valore aggiunto per commodities da materie prime sostenibili. In particolare, i lavori sulla pasta concentrano le analisi legando il concetto della sostenibilità ad altri temi come la salubrità degli alimenti. L'originalità dell'approccio del presente studio permette di inserirsi in questo contesto analizzando un ambito ancora poco indagato della letteratura.

La spinta al consumo sostenibile è un fenomeno che relativamente di recente ha coinvolto la massa dei consumatori e ha richiesto alle filiere di adeguarsi. Alla luce di questi aspetti è importante indagare in questo campo, sia in chiave politica che, e soprattutto, in un'ottica di mercato.

Lo sforzo sostenuto dal settore dell'agroalimentare per rendere i processi sostenibili comporta una modifica dei modelli di produzione partendo dalle materie prime. Il possibile riconoscimento da parte del consumatore che questo impegno delle filiere si traduce anche in un flusso di benefici per gli individui, grazie all'utilizzo di pratiche agricole più sostenibili, potrebbe generare una maggiore disponibilità a pagare per quei prodotti agroalimentari che presentano l'attributo di sostenibilità, quindi anche delle commodities. Questo valore aggiunto, riconosciuto dal mercato, potrebbe innescare dei meccanismi transazionali di filiera in grado di distribuire tale ammontare tra i diversi attori, compensandone gli sforzi effettuati per rispondere alla sfida della sostenibilità. Inoltre, comprendere se alcune attitudini, e quindi delle maggiori sensibilità ambientali, possano influenzare questo processo di riconoscimento e la WTP di alcuni gruppi di consumatori è importante per sviluppare future strategie sia da parte dei brand che dei policy-maker.

1.3. Structure of the Thesis, Data e Methodologies

Lo studio è stato svolto nell'ambito delle attività del progetto Diverfarming H2020². L'obiettivo principale di Diverfarming consiste nello stimare dal punto di vista ambientale, economico e sociale gli impatti della diffusione di pratiche agricole più sostenibili nell'ambito dei 6 diversi contesti pedoclimatici europei e quindi altrettanti stati (Italia, Spagna, Germania, Olanda, Ungheria, Finlandia). In particolare, il progetto prevede il coinvolgimento attivo di tutti gli attori delle filiere analizzate (agricoltori, industrie di trasformazione, logistica e consumatori) con l'obiettivo di evidenziare

² DIVERFARMING project (funded by UE-Horizon 2020, number 728003)

soluzioni condivise per l'incremento della sostenibilità delle produzioni, la tutela delle risorse naturali e la qualità del cibo in Europa.

La raccolta dati ha interessato la popolazione di 3 comuni italiani: Modena, Reggio Emilia e Parma. I territori sono tutti ubicati all'interno della Pianura Padana, che in Italia è una delle zone più intensamente interessate dalla produzione agricola. Il valore aggiunto del settore primario in queste aree è significativo, la presenza di molte industrie agroalimentari lo conferma, ma lo sono anche i numerosi problemi ambientali che stanno sorgendo e che derivano dai modelli di produzione intensiva. Questi generano esternalità negative, tra cui inquinamento idrico, perdita di biodiversità, degrado dei suoli.

Considerate le finalità dell'analisi è stato sviluppato un questionario suddiviso in diverse sezioni.

Nel primo blocco erano incluse diverse domande sulla conoscenza e percezione degli intervistati rispetto a pratiche agricole più sostenibili. Inoltre, agli individui è stato chiesto del loro livello di implicazione con gli agroecosistemi e i paesaggi rurali.

Nella seconda sezione, considerando gli obiettivi dello studio, sono state sviluppate due NMV secondo differenti stated preferences models, il choice experiment e la contingent valuation.

Dato che la natura dei metodi SP determinata dal fare riferimento a scenari/mercati ipotetici anche se perfettamente realistici può determinare diversi bias. Per ridurre la probabilità di distorsioni ipotetiche o strategiche determinate dai comportamenti degli intervistati prima delle analisi è stato inserito un incipit³ utile a contestualizzare, attraverso chiare informazioni, lo scenario (ipotetico) a cui si stava facendo riferimento (Carlsson et al., 2005; Cummings and Taylor, 1999).

Il disegno sperimentale del choice prevedeva due alternative dove si implementavano pratiche più sostenibili e un'alternativa con l'attuale sistema di gestione delle produzioni agricole.

Nella contingent valuation si chiedeva invece di dichiarare la massima disponibilità a pagare per un bene, in questo caso la pasta, prodotto con materie prime provenienti dai sistemi agricoli presentati nell'incipit.

3

“Con il progetto DIVERFARMING vorremmo comprendere quanto sei disposto a pagare di più, per avere dei prodotti che provengono da sistemi agricoli diversificati che minimizzano l'impiego di concimi, fertilizzanti, diserbanti e pesticidi, riducono i rischi di inquinamento, hanno effetti positivi sull'ambiente come aumento della biodiversità, animale e vegetale, incremento della capacità di stoccaggio del carbonio, tutela della qualità delle acque, salvaguardia paesaggio agricolo. Ora ti mostreremo diversi scenari Ciascuno scenario prevede due ipotetici sistemi colturali diversificati (A e B) e il sistema produttivo predominante nella Pianura Padana (Status quo). Nello scenario alternativo si considerano pratiche di rotazione colturale con colture azotofissatrici (come le leguminose), che consentono un naturale apporto di nutrienti al suolo, e strisce fiorite per aumentare la biodiversità e la proliferazione di insetti utili e microrganismi che aumentano la resilienza del sistema colturale. Sei in grado di scegliere una tra le seguenti alternative, considerando che le due alternative di diversificazione comportano un aumento nei tuoi costi alimentari per i prodotti sopra citati (quindi con la stessa quantità di consumo il costo è maggiore) rispetto alla situazione attuale”

La terza sezione includeva anche le principali variabili socioeconomiche, come l'età, il sesso, il luogo di residenza dell'intervistato, ecc.

Inoltre erano presenti una serie di items relativi al grado di impegno ecologico sviluppati secondo il Environmental Commitment Index (ECI) (Maloney et al., 1975). Al rispondente è stato chiesto di valutare il proprio grado di accordo con ciascuna affermazione in una scala Likert a cinque punti da 1 (totalmente in disaccordo) a 5 (totalmente d'accordo).

Il questionario, dopo un test pilota effettuato su 15 persone nel marzo 2019, è stato somministrato con metodo di campionamento casuale attraverso interviste faccia a faccia nel mese di maggio dello stesso anno. Il campione è stato selezionato nelle zone di Parma, Reggio Emilia e Modena in luoghi diversi dei tre comuni e in diversi orari della giornata. La selezione degli intervistati è avvenuta principalmente in luoghi pubblici, come piazze, parchi e strade, attraverso la scelta casuale di una persona ogni tre passanti. Gli intervistati sono stati informati dello scopo della ricerca e la raccolta dati è stata autorizzata attraverso il modulo di consenso previsto dal progetto Diverfarming. Il campione finale risultante dalle interviste è composto da 185 soggetti.

Alla luce delle differenti tematiche affrontate con differenti metodologie la tesi sviluppa in due differenti capitoli i rispettivi topic.

Nel primo capitolo la valutazione degli ESs prodotti dai sistemi agricoli conformi alle nuove GAEC viene implementata attraverso un Choice Experiment. Il disegno sperimentale è stato realizzato utilizzando s-efficiency design. Il software Ngene 1.0.2 (Rose et al., 2010) è stato utilizzato per combinare attributi e livelli e creare i set di scelta. Nell'analisi dei dati è possibile ricorrere, come in questo caso, ai modelli Conditional Logit. I fondamenti teorici su cui si basa la metodologia è la Random Utility Theory (McFadden, 1973) e multi-attribute theory (Lancaster, 1966). Nel disegno sperimentale è stato inserito un attributo di prezzo per poter poi sviluppare analisi sulla disponibilità a pagare. Tramite l'applicazione del Delta Method si ricava la Marginal Willngness to Pay per ogni singolo livello degli attributi scelti. Questi saranno combinati per creare gli scenari di adozione previsti dalle linee guida delle nuove GAEC da cui verrà calcolato il Compensating Surplus (Bennet and Blamey, 2001).

Nel secondo capitolo le analisi si soffermano su quali variabili subentrano nel processo di acquisto e influenzano la disponibilità a pagare dei consumatori. I dati provenienti da una Contigent Valuation sono utilizzati per analizzare i fattori sociali che condizionano la WTP per pasta prodotta con materie prime proveniente da sistemi agricoli più sostenibili. Tramite la Finite Mixture regression è stato possibile identificare dei gruppi di consumatori calcolando in che misura l'atteggiamento ambientale

personale, utilizzando la scala ECI, può influenzare la disponibilità a pagare per questa tipologia di prodotto (McLachlan and Peel 2004; Melnykov and Maitra, 2010).

In questo lavoro le analisi econometriche sono state sviluppate utilizzando STATA 15.1 software (StataCorp LP, College Station, USA).

Considerando che entrambi gli argomenti sono due facce dello stesso tema un capitolo finale conclude il presente lavoro. I risultati ottenuti dalle analisi serviranno ad effettuare un confronto sul diverso approccio che gli individui presentano riguardo la valutazione ambientale sia considerando la loro duplice natura (cittadini/consumatori) che il bene in esame (pubblico/privato).

2. CHAPTER 2

2.1. Introduction

Citizens' attention to the environment and the human activities' impact on natural capital is growing. In some sectors, more than others, this impact is much more evident, as in agriculture (Díaz et al., 2006).

The agricultural sector has faced conflicting challenges in recent years. The demand for increased production to feed the growing world population has led to intensive production systems that generated negative externalities.

Agricultural practices, such as monoculture, high use of chemical inputs and mechanization, cause damaging impacts on natural capital and on the capacity of ecosystems to provide Ecosystem Services (ES). According to the Millenium Ecosystem Assessment (MEA, 2005), the ESs classification considers the agricultural activities involved in each of the four Ess as producer and consumer (Costanza et al., 1997; Power, 2010; Dale and Polasky 2007; Swinton et al., 2007).

In the last century european agricultural systems, compared with an increase in production, have generated significant damage to the ecosystem (Huang et al., 2015; Pretty, 2018; Pe'er et al., 2014) and nowadays civil society has become more aware of these issues compare to the past. The requests, driven by structured networks of environmental associations and more informed consumers engaged on NGO stakeholder platforms, have affected the dynamics of multilateral environmental negotiation at different government levels (Krug et al., 2020).

Following the Sustainable Development Goals, defined by the United Nations 2030 agenda, and the New Green Deal (NGD), launched by the EU, European policymakers tried to integrate these requests by developing strategies and policies suitable to support a sustainable intensification approach (Feindt, 2010; Foley et al., 2011; Prager et al., 2012; Rey Benayas and Bullock, 2012; Tilman et al., 2011; Trewavas, 2002). Common Agricultural Policy (CAP) faces these challenges for years, starting from Stockholm Conference in 1972 (Cesaretti et al., 2011; European Commission, 2018a). In recent years, the increased awareness of environmental issues has gradually decreased this gap. European citizens show greater knowledge of the CAP topic (from 67% in 2017 to 73% in 2020); 76% of EU citizens in 2020, up from only 61% in 2017, recognise that this policy benefits the entire European population, not just farmers (Eurobarometer, 2018; Eurobarometer, 2020). The increased awareness of environmental issues related to European agriculture and food systems has led policy makers to tight negotiations focused on suitable changes on regulatory framework for European agriculture.

With its latest CAP reform, the EU wants to justify subsidies and payments to the agricultural sector for the main goal of European citizens well-being. It is possible through a series of tools, such as the new reformulated minimum ecological requirement called Good Agricultural and Environmental Conditions (GAEC), able to preserve natural resources, improve ecosystem services provision and mitigate climate change impacts (European Commission, 2018c; European Commission, 2021).

The relationship between agriculture, production, protection of natural capital emerge In the new CAP reform, but clarifying these aspects to civil society, which often does not familiar with CAP specific language, is not an easy task.

For this reason, it was decided to ask citizens to elicit a hypothetical value for the ESs potentially provided by more sustainable agricultural systems than current ones. Specifically, it was decided to test, through the Choice Experiment methodology, in a specific study area, Po Valley region, the value that citizens attribute to the ESs produced or improved thanks to the adoption of the three GAEC5, GAEC8, GAEC9. This area is most affected in Italy by intensive agricultural production and ecosystem services exploitation. In this context, the methodological approach presented below aims to assess if Po Valley citizens, not directly involved in agricultural activities but living in areas managed with an intensive production system, recognize the value of ecosystem services preserved by the proposals of the new CAP.

The results got to provide a general value estimation, not recoverable from the markets, that should be paid to European farmers as producers not only of agricultural products but also of ecosystem services. It stimulates a further evaluation of the value assigned, as support in First Pillar payments, to farmers for implementing these practices.

In section 2, the paper develops a focus on the link between CAP and ecosystem services, highlighting the fundamental steps that in the various reforms have led to a transition of European agricultural systems towards sustainability. A brief review is presented to justify the preference of the choice experiment as a tool in the ESs assessment and the related policies. Section 3 describes the case study and the methods used for the choice experiment analysis. Section 4 introduces the results. Section 5 includes the final considerations finding from the case study and general recommendations.

2.2. Background

2.2.1. Public goods and agricultural policy in Europe

Agricultural activities influence regulatory functions (such as climate, disease and flood regulation), support (such as nutrient cycling, soil formation), cultural services (such as aesthetic, educational, recreational) and provisioning (food, fiber) (de Groot et al., 2002; Fisher et al., 2009; Gobster et al., 2007; Power, 2010; van Zanten et al., 2014). Given the importance of these flows, policies over the

years have developed tools capable of implementing an incremental sustainable transition. Specifically, the CAP began the ecological transition in 1992 with the MacSharry reform, including the first agri-environmental measures in Reg. 2078/92 followed in 2003 by the Fischler reform in which farmers, to receive subsidies, had to comply with new environmental requirements, described as Statutory Management Requirements (SMR) and Good Agricultural Environmental Conditions on the European regulation 1782/2003 (European Council, 2003). The process of environmental policy integration in the CAP has been influenced by changes in European institutional governance. Lisbon Treaty (13 December 2007, de facto establishes the entry into force of a new negotiating framework (Eur-lex, 2008). European Parliament (EP), jointly with the Council, becomes “on an equal footing” and takes part in a co-decision role as “ordinary legislative procedure” also for CAP reforms (TFEU, 2008). European citizens, represented by the EP, could proactively express their requests. Currently, the European Union acted with a broader spectrum on sustainability by the multi-year budget, the New Green Deal (European Commission, 2019). Looking at the agricultural sector, the NGD identifies, among others, two priority actions to promote the ecological transition in the food sector: the Biodiversity strategy and the Farm to Fork initiative. These two strategies have made the links between well-being, accessible quality food and protection of natural capital even more clearly than in the past. The new CAP reform outlines ambitious goals. It introduces new tools to evaluate agri-environmental practices and their effectiveness (European Commission, 2018c; Hart et al., 2018). Despite the clear direction carried by the European Commission, the negotiations formally launched by the publication of the first proposal draft immediately revealed some disagreement points between the Council and Parliament, such as changes in the commitments related to both the conditionality and greening tools. The CAP-environmental policy approach of the new reform strengthens conditionality, pushing direct payments conditional on compliance with some additional or reformulated rules, bringing the number of GAEC commitments from 7 to 10. The new mandatory rules first set shows the Commission’s and Parliament’s intention to build a more efficient CAP in promoting environmentally friendly changes for the European agricultural production system. These new environmental and sustainability requirements set a higher ‘minimum ecological target’ than in the past for European farmers subsidised by CAP funds. From the official communication and the legislative proposal, CAP subsidies and payments have been justified to European citizens as public expenditure to preserve the landscape and biodiversity, mitigate the impact of climate change, and increase society well-being (Ekroos et al., 2014, European Parliament, 2021). This approach facilitated the European Commission’s green reform process to structure a proposal for the CAP 2021-2027 able of strengthening the social contract between society and the agricultural sector. Europe’s financial commitment to promote the ecological

transition employs around 31% of the EU's overall multiannual financial budget. 75% of the 386 billion euros, classified as CAP funds on the proposals for a new Multiannual Financial Framework (MFF) 2021-2027, will support the first pillar measures, specifically direct payments made in compliance with the conditionality criteria (GAEC).

2.2.2. Studies on ecosystem service valuation

Economists and ecologists have been discussing for years the correlation between the benefits of nature and human processes and the importance of evaluating them (Ehrlich and Ehrlich., 1977; Costanza et al., 1997). ESs are no market "products" and are not considered in cost-benefit analyzes, and, consequently, not even in landscape and environmental management. Failure to assess implicitly translates into a zero value of ecosystem services, even though these have much higher values (Daily, 1997; de Groot et al., 2010; García-Llorente et al., 2012). In this framework, the evaluation of ecosystem services for the potential impact that this can have in influencing society and the policies themselves (Loomis et al., 2000). Ecosystem services, particularly those related to the agricultural sector, are closely correlated to the context and the geographical area of reference both for the ES quantity produced and for the value that citizens and stakeholders of that area attribute to them (Diaz et al., 2006). The ecosystem services' economic value attributed by the beneficiaries may not correspond to the supply capacity of the agroecosystem concerned (Villamagna et al., 2013). Different methodologies have been developed in the ecosystem services evaluation processes. Choice experiments, a stated preference method, are among the most used (Hanley et al., 1998). The CE is applied because it evaluates preferences by choosing between different options present in the choice set. The alternatives are composed of the attributes declined at different levels. ESs studies based on a choice experiment allow to consider ESs individually or in combination with each other, to investigate the preferences of individuals, potential management options and the political key to be given to the assessment. This method allows to evaluate the acceptance of potential agri-environmental policy tools (Broch and Vedel, 2012; Grilli et al., 2018) and the individual ESs connected to them. Several studies have investigated the ESs value within agroecosystems based on the level at which they have been implemented (Alcon et al., 2020; Aslam et al. 2017; Barkmann et al., 2008; Beharry-Borg et al., 2013; Dupras et al., 2017; García-Llorente et al., 2012).

2.3. Methods and data

2.3.1. Case study area description

The approach to value estimation, attributed by citizens to ESs through a Choice Experiment, was applied to an Italian study area. Case studies are in the Mediterranean North pedo-climatic region, in

the Po Valley, specifically, the study involved farms, value chain operators and citizens of three Emilia-Romagna provinces, Modena, Reggio Emilia and Parma (Fig.1).

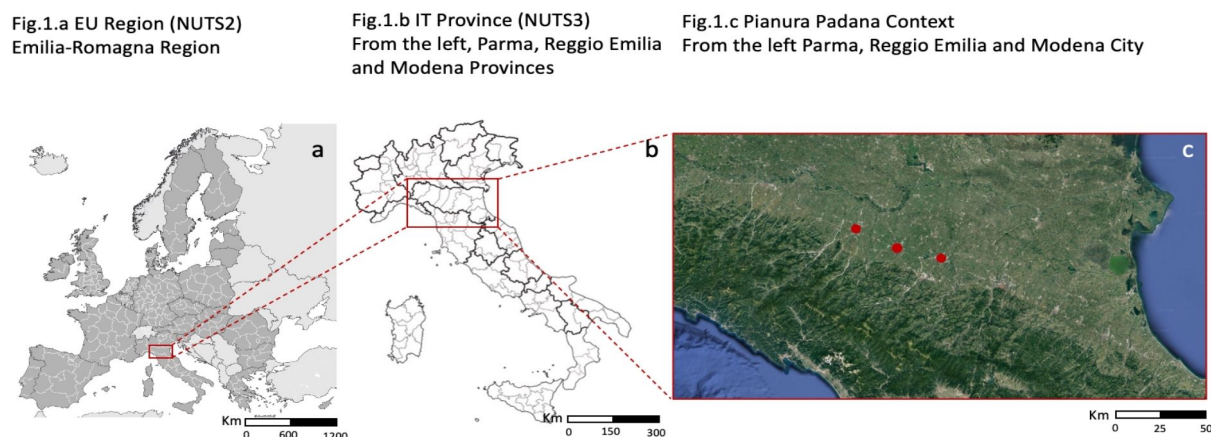


Figure 1 Case study area

The added value of the primary sector in this area is also significant because of many agri-food industries and supply chains linked to typical food production and geographical indications marketed worldwide, Parmigiano Reggiano and Prosciutto di Parma, among the others.

The river Po basin is the largest productive agricultural area in Italy, which is about 70% of the total Italian surface. The area is characterised by a high concentration of professional farms. These are mainly specialised in cereals, horticulture and in raising livestock for meat and milk. Over the years, the intensive production models in this geographical area have contributed to various environmental problems. The structure of the economic and productive systems has led to an increase in the last 40 years of negative externalities, such as water pollution, loss of biodiversity and soil fertility, soil compaction, high CO₂ equivalent emissions and simplification of the landscape (Bani et al., 2010; Fava et al., 2009; Perego et al., 2012).

Practices/tools/actions such as those provided for by the new GAEC would act on the mitigation of those environmental problems, driving a transition to a more sustainable production system (Rodríguez-Ortega et al., 2016; Varela et al., 2018).

2.3.2. Experimental design

The method implemented for a Non-Market Valuation (NMV) is based on a Choice Experiment. It is a stated preference method based on multi-attribute theory (Lancaster, 1966) and random utility theory (McFadden, 1973). The CE method is often preferred in many studies since it is useful when analysing hypothetical scenarios without real data to basing the statements (Bateman et al., 2002; Novikova et

al., 2017; Turner et al., 2010). According to Hoyos (2010), the experimental design was structured in the four classic stages of the Choice Experiment:

- Attributes and levels definition
- Choice set and block selection
- Questionnaire structure definition
- Data collection

Considering the case study area features and the related environmental issues, generated by the intensive and specialised agricultural systems, a detailed analysis was carried out for attributes and levels selection.

Based on these considerations and a literature review, a discussion with DIVERFARMING soil scientists and life science researchers was managed (Batáry et al., 2015; Ekroos et al., 2014; Tienhaara et al., 2019). Through the collection of this information, it was possible to develop a series of interviews and Focus Groups with different agricultural sector actors to select the attributes and their level necessary to elaborate the experimental design of the choice experiment. The chosen attributes and levels are shown in the following table:

Table 1: *Attributes and levels of the choice set*

Attributes	Description	Levels
Biodiversity	Expected % of soil microbial richness increment over monocropping	Low / Medium / High
Net CO ₂ balance	CO ₂ eq emission potentially avoided, monitored by specific measures and predictive models	Low / Medium / High
Risk of water pollution	Presence of macro-nutrients in soil water	Low / Medium / High
Diversified agricultural landscape	Perception of agricultural landscape beauty	Yes / No
Monthly food expenditure percentage increase	Monthly increase in foodstuff expenditure per family (considering same quantity of consumption)	10%, 25%, 50%, 75%, 100%

All the activities agreed the practices implemented through the selected GAECs contribute significant benefits for the chosen attributes. These benefits cover two types of issues: the environmental ones such as improving biodiversity, controlling water pollution and carbon sequestration; and cultural goods, such as landscape aesthetics. The attributes level related to the ESs are expressed in qualitative terms to be more understandable to the sample subjected to the Choice experiment (Alcon et al., 2020; Mitchell and Carson, 1989; Perni and Martínez-Paz, 2017). Including the cost attribute, it is possible to assess the potential increase in food spending (per household) resulting from the demand for the purchase and consumption of products by more sustainable agricultural systems. The cost attribute levels were selected based on the average monthly spending per household on processed tomatoes (canned, jar and bottle), pasta and biscuits, snacks and other bakery products. These products are all included in the basket of spending used for other sector analyses. The raw materials used in production are among the most widespread crops in the arable lands of the area's object of study.

The calculated average expenditure takes as a reference is based on data referred to the case studies areas. Official data provided by the Italian National Institute of Statistics regarding Emilia Romagna region, classified as NUTS2 area by European statistics nomenclature, has been used (ISTAT, 2018). Starting from an average of 30€/household/month expenditure, the five levels of increase (10%, 25%, 50%, 75% and 100%) are defined. The experimental design was created using Ngene 1.0.2 software (Rose et. al, 2010). The attributes, and the corresponding levels, were combined by an s-efficiency design for the pilot and final survey.

The final design included 30 choice sets divided into 5 blocks distributed randomly among the interviewees who were asked, for each card, to choose one of the three alternatives. Each choice set was structured combining two alternatives representing a “more sustainable production” and the alternative Status Quo (SQ), to which the prevalent intensive production model based on monoculture was associated. To simplify the CE understanding, the respondents were shown an illustrated card with images corresponding to the levels of the attributes of each choice set (Fig.2).

Scenario 1.1	Diversification A	Diversification B	Status quo
Biodiversity	 High	 Low	 Low
Carbon Balance CO2	 Low	 Medium	 Low
Water pollution risk	 Low	 High	 High
Agricultural landscape	 Monoculture	 Monoculture	 Monoculture
Cost	30 €	22.5 €	0 €
Choice	☐	☐	☐

Figure 2 Example of a Choice set used in the CE

2.3.3. Econometric model

According to the random utility theory (McFadden, 1973), the utility (U_{ijt}), provided by alternative j to the individual i in a set of choices t , divides into an observed part (V_{ijt}) and an unobserved part (ε_{ijt}):

$$U_{ijt} = V_{ijt} + \varepsilon_{ijt} \quad (1)$$

V_{ijt} , the deterministic part of utility, is defined by the attribute levels and socio-demographic characteristics of individuals. ε_{ijt} is the iid term of stochastic error. Assuming V_{ijt} as the weighted sum of the levels of the attributes of our analysis and the individual characteristics U_{ijt} is:

$$U_{ijt} = \beta X_{ijt} + \varepsilon_{ijt} \quad (2)$$

X_{ijt} represents the levels of attributes and individual characteristics and β the marginal utility associated with them. The model used to estimate the utility is a Conditional Logit (CL).

Not being able to directly observe the utility perceived by the respondent, the β is estimated maximizing the probability of the choices observed. The probability P_{ijt} , estimated with the maximum likelihood method (Train, 2009), of individual i to choose alternative j , in a set of choice t can be formulated as follows:

$$P_{ijt} = \frac{e^{V_{ijt}}}{\sum_{p=1}^J e^{V_{ipt}}} \quad \forall j \neq p \quad (3)$$

In this analysis, the utility of the individual's choice of an alternative derives from his characteristics and from the provision of ecosystem services, which include the different attribute alternatives. For this study, there are biodiversity, water pollution risk, CO₂ balance, landscape and cost with a model with the following functional form:

$$V_{ijt} = \beta_0 SQ + \beta_1 BIOD_{jt} + \beta_2 CO2B_{jt} + \beta_3 WTPO_{jt} + \beta_4 LAND_{jt} + \beta_5 COST_{jt} + \varepsilon_{ijt} \quad (4)$$

Where in the utility V_{ijt} of the individual i for the alternative j in the set of choices t there is β_0 , associated with the current situation of Status Quo (SQ), and β_k , the marginal utility provided by each ES_k generated by the agroecosystem which reflects how it changes the utility level if the ES level increases.

β_0 is associated with current CAP greening requirements (SQ), β_1 refers to biodiversity (BIOD); β_2 and β_3 are related to regulating services (CO2B and WTPO) CO₂ balance and water pollution risk respectively; β_4 is related to a cultural service (LAND) and, finally, β_5 is the coefficient for the assumed extra cost (COST) for the purchase of food produced by more sustainable cropping systems. The CL model is a fixed-effects model, which means in the treatment of the coefficients β_k , homogeneity is assumed between the responses and between choice preferences, with k number of attributes of the experimental design (Train, 2009).

By introducing the extra cost attribute, it was possible to calculate the willingness to pay (WTP) for the other attributes. The marginal rate of substitution between the non-cost attributes coefficient (β_k) and the cost attributes (β_5) shows the marginal willingness to pay (MWTP) for the attributes it refers to. It represents the economic terms that respondents are willing to pay for each level of each ES provided by the agroecosystem and it is calculated as follows:

$$MWTP = -\left(\beta_k/\beta_5\right) \quad (5)$$

The different ES levels were combined to create 3 different hypothetical scenarios. These reflect the adoption and combination of GAEC requirements defined by the new CAP proposal.

Once the creation of the scenarios, it was possible to derive the Compensating Surplus (CS) (Bennet and Blamey, 2001):

$$CS_{mgi} = -\left(\frac{V_{sqi} - V_{mgi}}{\beta_5}\right) \quad (6)$$

The CS translates in economic terms the increase in individual well-being generated by the transition from the current situation. Negative values imply respondents are willing to pay to support the change towards hypothetical different management scenarios. Through the CS, it is possible to combine the coefficients of the attributes by measuring their value in monetary terms.

Thus, it is possible to create hypothetical scenarios in which different policy tools are implemented (Bennett and Blamey, 2001; Bergmann et al., 2006). For the study, it will allow for the economic assessment provided by citizens concerning the new GAEC implementation.

2.3.4. Questionnaire and sampling

The questionnaire structure included a series of items and statements to reduce the risk of bias because of misunderstanding (Lopez-Becerra, 2021; Mitchell and Carson, 1989). In stated preference methods, hypothetical or strategic biases can occur. The respondents may not do what they declare and, given the hypothetical nature of the analysis, they may overestimate or underestimate their real preferences (Carlsson et al., 2005; Cummings and Taylor, 1999; Tonsor and Shupp, 2011). To minimize these biases, the questionnaire included a statement, contextualizing the survey, introducing the choice set and providing clear information on the cited agriculture practices (Fig. 3b). The questionnaire was structured in 4 sections (Fig. 3a). A pilot test with 15 people tested the choice set and items.

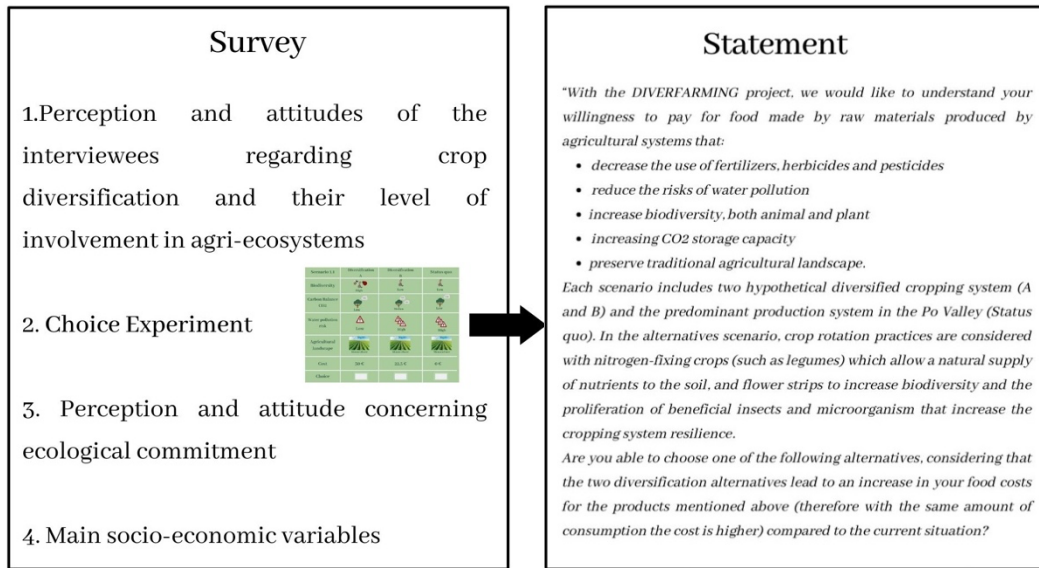


Figure 3a Survey section

Figure 3b Choice set statement

The final and tested questionnaire was carried out through face-to-face interviews, in the urban areas of Parma, Reggio Emilia and Modena. The sample was interviewed on different days in different places and times of the three cities in 15 days between May-June 2019. Interviewees selection was carried out through a random choice, inviting one person every three passers-by. Respondents were informed about the purpose of the survey and the implications of their participation, authorised by them through a verbal consent statement.

According to data from the National Statistical Institute (ISTAT, 2018), the three cities have 552,904 residents as of 01/01/2018. To estimate the number of households, this number was divided by the national average of 2.40 persons per household.

The sample of respondents (Table 2) is composed of 185 individuals with an average age of 47. It is representative in terms of gender (50.81% women). The average age of the sample is about 47 years, in line with the regional average. Individuals were divided into four age classes (18-30 years; 31-45 years; 46-60 years; > 60 years). Over 60 represent the largest group (29.73%) while people from 46 to 60 years are less represented, with 22.16%. The sample is not representative in terms of the educational level of the population of the reference area. 51.35% of the interviewees are freelancers or employees, while 16.22% are students.

Table 2. Descriptive statistics

Variable	Sample	Population
Age of people over 18 years old		
18-30 years (%)	25.41	15.72 ^a
31-45 years (%)	22.70	25.17 ^a
46-60 years (%)	22.16	27.00 ^a
> 60 years (%)	29.73	32.12 ^a
Gender(women)	50.81	51.18 ^a
Educational level		
Lower Education	4.86	18.47 ^b
Primary Education	16.22	25.46 ^b
Secondary Education	49.19	32.38 ^b
Higher Education	29.73	16.68 ^b

^a ISTAT (2018); ^b > 6 years (%) ISTAT (2011)

The unemployed category (7.57%) also includes those who are actively looking for a job and housewives. Only 16.22% of the interviewees are made up of families with children (0-12 years), with an average of 1.77 children each. Although the sample was not directly involved in the agricultural sector, it showed a good knowledge of it, about 81% of the interviewees were aware of the most sustainable agricultural practices, including crop rotation.

2.4. Results and discussion

2.4.1. Results of the CE analysis

CLogit model results are presented in the table (3). The coefficients are estimated by the different levels of the attributes of the utility function. Except for CO₂ balance-High level, the variables are significant and as a whole; the model was considered valid (Pseudo R² = 0.1786) and comparable to other results conducted by similar studies (Aslam et al., 2017; Niedermayr et al., 2018; Ragkos and Theodoritis, 2016).

The estimates show a positive marginal utility, i.e., a positive impact of ecosystem services on the utility function. The coefficients show an improvement in the ESs is positively assessed by the interviewees, regarding biodiversity, the risk of water pollution and the Cultural ES linked to the landscape. In this analysis, it must be considered that there are ESs whose damage involves negative externalities that are clearer to the citizens. These represent for the local community a direct concrete risk, e.g., water pollution. Other externalities, while having a similarly damaging impact, are less clear

in the short term and perhaps more difficult for society to understand, e.g., in equivalent CO₂ equivalent emissions. The price attribute with a negative sign shows a negative marginal disutility, i.e., as the price increases, there is a lower propensity to make this choice. SQ presents a negative sign. The respondents, therefore, show a generalized desire to change the current production system in favour of a more sustainable one.

Table 3. *Conditional (fixed effects) logit regression model results*

Choice(variables)	Coefficient	Standard Error
SQ	-1.017***	0.186
Biodiversity – Medium	0.766***	0.123
Biodiversity – High	0.889***	0.132
CO2 balance - Medium	0.233*	0.126
CO2 balance - High	0.111	0.144
Water pollution risk - Medium	0.633***	0.129
Water pollution risk - Low	0.602***	0.127
Diverse Landscape	0.284***	0.101
Cost	-0.050***	0.006

*** Statistically significant at a level of 0.01.

Number of observations = 185; LR chi2 (10) = 419.13; Prob > chi2 = 0.0000; Pseudo R2 = 0.1786.

By applying the Delta method (Hole, 2007) to the CLogit model, the Marginal Willingness To Pay (MWTP) was calculated for each attribute/level (Table 4).

Table 4. *Marginal Willingness to Pay (€/household/month) analysis results.*

Attribute	MWTP (€/hh/month)	Standard Error	[95% CI]
Biodiversity – Medium	15.19***	2.546	10.20 - 20.18
Biodiversity – High	17.61***	2.189	13.32 - 21.90
CO2 balance - Medium	4.62*	2.368	-0.02 - 9.26
CO2 balance - High	2.20	2.718	-3.16 – 7.53
Water pollution risk - Medium	12.54***	2.545	7.55 – 17.53
Water pollution risk - Low	11.93***	2.489	7.05 -16.81
Diverse Landscape	5.62***	1.915	1.87 – 9.38
SQ	-20.16***	4.534	-29.04 – -11.27

*** Statistically significant at a level of 0.01.

The MWTP concerning all variables associated with ecosystem services is positive. The respondents have a positive utility, in terms of well-being, for each level of each ES examined.

The MWTP related to CO2Balance-High is not statistically different from zero. Considering the MWTP results of each ES, the changes in biodiversity levels are the most valued by citizens, respectively 15.19 €/household/month for Biodiversity/medium and 17.61 €/household/month for Biodiversity/High. The presence of a more diversified landscape transfers an intrinsic price of 5.62 €/household/month.

2.4.2. GAEC adoption scenarios evaluation

Because of the purpose of this research, it is interesting to measure the Compensation Surplus (CS). It translates, in monetary terms, the advantage of moving from the current situation (SQ) to another management scenario. These are designed considering different arable management systems in which the new GAECs are implemented.

Each option has different levels of ES, compared to the SQ, considered based on the expected increase because of GAEC practices included in the CAP proposal. The scenarios consider increasing or adding ES based on the requirements potentially implemented in each GAEC.

The Farm Sustainability Tool for Nutrients (FSTN), required by GAEC5, would provide better nutrient management. It would cause less nutrient dispersion in soils, reduction in GHG emissions, soil quality improvement and a lower risk of water pollution (European Commission, 2019). Practices such as crop rotation (GAEC 8) represent a major effort for the farm (such as sowing planning) but act by improving soil quality, biodiversity and the risk of pollution. GHG emissions reduction depends on the type of crop rotation implemented in the production systems (Bezdicsek and Granatstein, 1989; Farina et al., 2017; Kremen and Miles, 2012; Novikova et al., 2017; Vleeshouwers and Verghagen, 2002). GAEC 9 requires actions as maintenance of non-productive areas, landscape elements conservation and ban of specific activities during the determined species breeding/nesting periods. These commitments help preserve biodiversity and the provision of cultural ES, as landscape (European Commission, 2019).

The scenarios combine GAECs by considering an increasing level of improvement in the provision of ecosystem services:

- The NG5 scenario examines the implementation of the new GAEC 5, associating with the FSTN adoption on the farm. This scenario reproduces an intensive agriculture system in which a tool is implemented that allows fertilizers' rational use. It acts on the mitigation of the risk of water pollution and the reduction of GHG emissions.
- The NG58 scenario combines GAEC 8 with GAEC 5. This scenario reproduces an intensive and diversified agroecosystem characterized by crop rotation and the adoption of Farm

Sustainability Tool for Nutrients. The pollution reduction would be associated with biodiversity improvements and cultural ES at the landscape level.

- The NG589 scenario adds GAEC 9 to GAEC 5 and 8. This scenario considers a cropping system new diversification in which 4% of the land is dedicated to non-productive elements and areas. The changes, d because of implementing GAEC 5 and 8, would be attended by improvements in terms of biodiversity and typical landscape elements.

The CS estimation of citizens for the scenarios is shown in Table 5.

Table 5. *Hypothetical GAEC adoption scenarios estimation*

Scenario Code	GAEC code	GAEC new requirement	Expected Ecosystem Services/level	CS ¹ (€/hh/month) Average [95% CI]
SQ	GAEC (CAP 14/20)	-----	Water pollution risk/high Biodiversity/low CO2 Balance/low Landscape/no	20.16 [29.04;11.27]
NG5	GAEC 5	Nutrition Tools	Water pollution risk/med Biodiversity/low CO2 Balance/med Landscape/no	37.32 [38.06;36.61]
NG58	GAEC 5 GAEC 8	Nutrition Tools Crop rotation	Water pollution risk/low Biodiversity/med CO2 Balance/med Landscape/yes	57.53 [68.63;51.31]
NG589	GAEC 5 GAEC 8 GAEC 9	Nutrition Tools Crop rotation Landscape elements +Non-productive area	Water pollution risk/low Biodiversity/high CO2 Balance/med Landscape/yes	59.95 [68.63;51.31]

¹ Negative values from CS have been transformed to positive in order to easily understanding.

Citizens are willing to pay to support the transition to more sustainable production systems. By comparing the values, the interviewees prefer the hypothetical scenarios to the current situation of management of production systems (SQ). Increasing values show that respondents benefit more than the provision of ecosystem services increases. These results are like other similar studies in the literature (Alcon et al., 2020; Birol et al., 2006; Dias and Belcher, 2015; Huang et al., 2015; Iqbal 2020; Nijhum et al., 2021; Swinton et al., 2007)

Starting from the SQ, the interviewees are willing to pay around 20 €/household/month to leave the current situation and support a more sustainable production system.

In the NG58 scenario, the system provides several changes as biodiversity improvements, pollution reduction and cultural ES at the landscape level. This scenario shows a CS of 57.53 €/household/month. Observing the differences between the CS results and the expected ESs improvement, the interviewees reveal a small delta between the NG58 and NG589 scenarios.

2.4.3. Public expenditure and farmer compensation

The results showed the improvement of ecosystem services, and the related environmental benefits, are socially required. Citizens are willing, at least hypothetically, to increase their spending budget for food.

Considering the limits of the analysis, it is possible to highlight that these citizens show a request for ESs improvement produced by more diversified agricultural systems. It justifies an income transfer to support food production systems for implementing practices that pursue sustainability objective. Observing the CS values and assuming a representative household interviewed panel of the investigated provinces, an interesting picture would emerge for interpreting the result in terms of hypothetical transfers of ESs values from citizens to the agricultural sector (Table 6).

Table 6. *Hypothetical farmer compensation estimation.*

Scenario code	Hypothetical value	Δ Hypothetical value/greening fee(CAP14-20)
	€/ha/year	€/ha/year
NG5	307.95	177.95
NG58	410.00	280.00
NG589	499.37	369.37

A subset of the consumption basket for commodities produced with raw materials from arable land, corresponding to an average expenditure of 30 €/household /month, was considered as real expenditure that citizens make to “support” the current greening scenario management (CAP 14-20). Compared to this baseline condition, the CS scenario of NG58, if confirmed by a representative panel of the provincial population, could generate a value of 488M €/year got by multiplying the CS by the number of households for 12 months of hypothetical expenditure for three products typologies (Pasta, Processed Tomato, Bakery) generated by supply chains that have considered the adoption of new GAEC at farm level. This hypothetical value could be divided between different actors in the food value chain. Using 22% as a percentage of added value that the farmer, generally, gets on the final

value of these products (ISMEA, 2020a, ISMEA, 2020b, The European House - Ambrosetti 2019), approximately 105M €/year might be transferable to farmers who apply new GAEC on their arable land.

Assuming a linear redistribution of this value over all 245,000 hectares of Po Valley arable land that could produce durum wheat, soft wheat and/or industrial tomatoes, farmers could receive a hypothetical value of around 410 €/ha/year. This hypothetical income transfer from citizens to agricultural producers could cover an expected increase in the production costs of agricultural products. Farmers could perceive an increase in their costs because of investments in specific nutrient management tools (GAEC5) and the risk of lost revenues because of introducing new crops into their crop plans (GAEC8). However, these extra costs typology required by the activation of more sustainable production are already partially supported by the first pillar of the CAP. The greening percentage in the direct payment, equal to 30% of the basic payment, can be interpreted as an effective income transfer from citizens to European farmers (Diotallevi et al., 2015). In the case study area, in the three provinces of the Emilia-Romagna Region, the value of CAP payment is approximately 390 €/ha/year (AGREA, 2021). About 130.00 €/ha/year (greening fee) are paid to farmers to compensate for their additional efforts in managing arable crops according to the sustainability criteria of the current CAP.

Considering the difference between the hypothetical value that citizens attribute to the practices examined and the income already transferred to farmers, as a greening quota of direct decoupled payments, there is a surplus of about 280.00 €/ha/year. Overall, it can say that the interviewees are legitimizing the strengthening of the green commitments planned by the new CAP reform. The new GAECs are the subject of the new reinforced conditionality, which absorbs and extends the requirements provided by the current greening. However, these seem able to intercept a higher consumers' willingness to pay. From the perspective of CAP reform, it is necessary to discuss if whether this gap will be recognized and, if so, how it will be settled. It is important to understand whether it will be provided through the first pillar payments or whether the market will intervene to cover the higher costs incurred by farmers because of implementing the more sustainable system. The market could intercept this higher WTP of citizens and, through transactional mechanisms in the supply chain, improve the distribution of added value among the actors, giving producers of raw materials a higher percentage. These are general indications. To have a comprehensive overview of the impacts that these practices determine at the farm level, further analyses should be implemented, using more detailed cost-benefit analysis at the farm and regional level.

2.5. Conclusions

In the legislative proposals of the CAP reform framework, the environment plays a fundamental role. One of the main focuses is on supporting the transition to a sustainable agricultural sector. Its rationale is to maintain cross-cutting tools aimed at supporting farmers' income by using public concern for environmental issues as the main policy justification. The urgent challenges raised by society in terms of sustainability requests a CAP with a more innovative and efficient approach and tools that could satisfy the needs of farmers and citizens and the environmental requirement too.

This study aimed to investigate the society WTP in terms of ecosystem services, which are translated and implemented within the GAEC guidelines of the new CAP (European Commission, 2018d, European Commission, 2021). Despite the limitations of the analysis, i.e., a non-representative sample of citizens, this approach can provide an innovative evaluation instrument useful for policymakers to test the acceptance and effectiveness of policy strategies and tools.

Preliminary results of this study show that citizens recognise environmental benefits provided by a more sustainable agricultural system, compared to current management conditions. In addition, it is possible to declare that demand for some ecosystem service and relative willingness to pay exists. These are useful information's that could assess citizens' willingness to accept the new CAP reform, furthermore, to evaluate the real understanding about the ongoing EU efforts to lead agricultural systems on sustainable transition pathway.

The result shows that citizens are willing to pay to promote intensive agricultural production systems transition to sustainable ones. They are not only legitimizing the ongoing CAP greening process, but they also show a surplus, in economic terms, compared to the greening payment currently received by farmers.

This evidence supports the logic of enhanced conditionality, where GAECs are in the first pillar of the CAP as mandatory requirements for beneficiaries of the decoupled payment.

Cautiously, it is possible to plan some policy implications about the new CAP "green architecture". The new GAECs incorporate and strengthen the current greening, changing the applications methods but reinforcing the cogency. GAEC 5, by introducing the requirement to adopt a tool for nutrient control, adds a decisions support system starting from nutrient management. In GAEC 8, with the crop rotation, the commitment required to the farms is strengthened concerning the greening of CAP 14-20, where the broader theme of crop diversification is present. The specific request for rotation affects management and multi-year planning, given the obligation to alternate crops over the years on the same surface. GAEC 9 request the maintenance of non-productive areas for protecting the landscape and biodiversity.

The new green architecture of the CAP proposal follows a clear path. The conditions required to the farmers as mandatory environmental commitment are increasingly binding and rigorous. It is necessary to respond to the request of society in terms of sustainability, fight against climate change and with the New Green Deal strategy.

From this point of view, the unpaid value of the farmers' effort could be paid by consumers via the market. This one could intercept the higher citizens' WTP and, because of transactional supply chain mechanisms that generate a network of win-win solutions between the actors, allow a fairer added value distribution which would also increase the percentage recognized to farmers.

3. CHAPTER 3

3.1. Introduction

The stress that the intensive management of agricultural systems exerts on the environment concerns society. The growing awareness that certain consumption practices affect natural resources and the ability to supply ecosystem services has led to increasing demand for sustainable agri-food products (Cecchini et al., 2018; Nash, 2009; Vanhonacker et al., 2013).

In the last 20 years, especially in developed countries, there has been a growth in demand for this type of product, which are not only destined for a niche market (de-Magistris et al., 2016; Vermeir and Verbeke, 2006).

Consumers' more sustainable food choices are having an impact on the market. This type of consumption is bringing about a change in food production. Sustainability implies a different approach and a more increased effort of the supply chains. Sustainable production impacts every phase, from agricultural production to transformation processes, from packaging to sale (Consuelo, 2020; Grunert, 2011; Recchia et al., 2019).

The production of more sustainable food starts at the base of the supply chain with the implementation of agricultural practices that are more respectful of the environment, which allow the supply of sustainable raw materials. It often involves a change in production systems. The farmers' efforts are partly supported by policies, such as the CAP, which for years have been investing in agricultural systems sustainable transition and by private brand initiatives (Cesaretti et al., 2011; European Commission, 2018a; Feindt, 2010; Menozzi et al., 2015).

In this perspective, some agri-food sectors have developed voluntary supply chain protocols which, due to the collaboration between the main actors (agricultural producers, food industry, suppliers) and the support of experts and research institutions (such as universities), aim to respond to consumer needs and create higher value for the players involved (Blasi et al., 2015; Bravi et al., 2021; Chkanikova and Lehner, 2015; Fouilleux, 2012; Fulponi, 2006; Govidan, 2018; Hamprecht et al., 2005; Jones et al., 2008; Muradian and Pelupessy, 2005; Pancino et al., 2019).

Considering the volume and effort that each actor places to respond to this challenge, it is important to understand if the consumer recognizes a higher willingness to pay (WTP). The recognition of higher added value allows, through transactional chain mechanisms, to distribute this amount among the different stakeholders.

Usually, consumers in their purchasing processes are influenced by convenience, brand loyalty and value for money (Carrigan and Attalla, 2001; Weatherell et al., 2003). From several studies in the

literature, it emerges that in the process of purchasing sustainable products there are additional factors such as socio-demographic variables, psychological factors, sensitivity to ethical, environmental, social issues (Abeliotis et al., 2010; Aprile and Punzo, 2022; Diamantopoulos et al. al., 2003; Kemp et al., 2010; Meulenbergh, 2003; Prothero et al., 2010; Vermeir and Verbeke, 2006).

Sustainability is an intangible attribute that the consumer cannot "verify" except through the information present on the packaging (Grunert, 2011; Quinton and Harridge-March, 2008).

The market has responded to this need by creating labels and certifications (Grunert et al., 2014; Pierrot et al., 2011).

According to a European Commission study, in 2012 there were, at the EU level or in individual countries, a total of 129 public and private food information schemes concerning sustainability (European Commission, 2012). Such a large number has led to an overload of information in the consumer's purchasing process, causing general confusion and gaps in knowledge of the messages conveyed (Comas Marti and Seifert 2012).

Despite this aspect, several studies have shown that agro-food products with sustainability attributes have a higher WTP than conventional ones (Cecchini et al., 2018; Tait et al. 2016; Van Loo et al., 2015; Vecchio and Annunziata 2015). Furthermore, in the purchasing process, the consumer increasingly considers the interconnections between environment, health and food (Palmieri, et al., 2021; Zanolli and Naspetti, 2002).

From this point of view, organic products are, among all, those to which consumers immediately attribute these characteristics that determine a higher willingness to pay (Aertsens et al., 2009; Cerutti et al., 2011; Grunert et al., 2014; Kalogeras et al., 2009; Krystallis et al., 2006; Rizzo et al., 2020; Seo et al., 2016).

The literature has focused a lot on this theme, investigating to a lesser extent other agricultural practices equally linked to sustainability achievement. The research carried out in this field is very specific, for certifications and types of products investigated. Specifically, particular attention was paid to products with high added value from the beginning, such as wine, which makes it difficult to generalize the results to other types of food (Forbes et al., 2009; Pomarici and Vecchio, 2014; Schäufele and Hamm, 2017; Sellers-Rubio and Nicolau-Gonzalbez, 2016; Vecchio, 2013).

However, the drive towards sustainable consumption has led the agri-food sector to differentiate through these characteristics mass-market products too. The literature still presents few works that aim to evaluate the recognition of a higher added value for commodities from sustainable raw materials. For a product such as pasta, intended for mass consumption and not very differentiated, it focused mainly on the theme of sustainability connected to the concept of healthiness, considering the

production with functional raw materials (Defrancesco et al., 2017; Lemken et al., 2017; Palmieri et al., 2021).

In this framework, the present study tries to fit into this literature gap, investigating consumers' willingness to pay for a product typical of the Italian tradition with low added value, dry pasta produced with raw materials, durum wheat, coming from sustainable agriculture systems. Specifically, what type and to what extent individual environmental attitudes may influence the WTP for this food. The value will be elicited through the responses to a questionnaire based on stated preference methods, specifically a Contingent Valuation (CV). From an empirical point of view, once collected questionnaires from 185 random sample individuals who live in Center Italy, WTPs are analyzed by using the finite mixtures (FM) regression (McLachlan and Peel 2004; Caracciolo and Furno 2020). FM allows to identify homogeneous groups of consumers for their socio-demographic characteristics, sharing at the same time the same structure of preferences towards pasta obtained from sustainable agricultural systems without any prior knowledge or assumption on the specific number of groups.

The pasta supply chain in Italy represents a strategic agri-food sector but the information gaps make it difficult to reconstruct the distribution of value among the main players, i.e., agricultural producers, the milling industry, the pasta industry and distributors. (Carillo et al. 2017; Cacchiarelli et al., 2016; Cacchiarelli and Sorrentino, 2018; Frascarelli et al., 2021).

From Nielsen 2018 sources, out of € 100 spent on semolina pasta purchases, wheat producers only received a share of € 24.10 (ISMEA, 2019).

The higher added value recognition, determined to the attribute of environmental sustainability of raw materials, would be fundamental to improve the farmers' position within the value chain and to compensate for the efforts caused to implement more sustainable agricultural practices (Dobson, 2003).

3.2. Materials and methods

3.2.1. Case study area description

The case studies are in the pedoclimatic region of the Northern Mediterranean, precisely in the Po Valley. The study examined three municipalities in the Emilia Romagna region: Modena, Reggio Emilia and Parma. In this area, the Po River basin, there is 70% of the Italian agricultural area, managed mainly with intensive production models. For these reasons, the added value of the primary sector is relevant compared to other Italian regions. There is a significant concentration of agri-food industries in the area. This structure of local economic systems, including the agricultural sector, has resulted in negative impacts on strategic natural resources by generating soil degradation, loss of fertility and

biodiversity, water pollution and high CO₂ emissions (Bani et al., 2010; Fava et al., 2009; Perego et al., 2012).

In the cereal sector, although only 7.3% of the surface of durum wheat is concentrated in the Po Valley (5% only in Emilia Romagna), due to the high yields it reaches over 12% of national production (ISTAT, 2021). The semolina pasta industry is one of Italian agri-food sector strategic supply chains and leader at international level. In the area, there is an important concentration of numerous stakeholders from the pasta supply chain, 47% of the cereals elevators are in Northern Italy, 25% between Emilia Romagna and Lombardy, and 56% of the milling industry, including large industrial groups, sector leaders, operating on the international market (ISMEA and RRN, 2018).

Given the strategic and economic importance of the pasta supply chain in the area and the importance attributed to sustainability given by consumers, differentiation of products is suitable. The drive towards the supply of more sustainable raw materials requires the implementation of agricultural practices designed to mitigate the impacts on natural resources. Crop rotation, with the inclusion of an oilseed or legume, nutrient management tools, minimum tillage practices and the presence of non-productive areas in the farms would act on the environmental problems generated by years of intensive soil management (Altieri and Nicholls, 2005; Blasi et al., 2017; Pretty and Bharucha, 2014; Tellarini and Caporali, 2000).

3.2.2. Theoretical framework

The study aims to investigate whether there are socio-demographic or attitudinal factors that can influence the willingness to pay for semolina pasta produced with sustainable raw materials. To achieve this goal, it is necessary to apply different methodologies. The value of willingness to pay was elicited by a question based on the contingent valuation method.

Starting from this it was possible to investigate the heterogeneity within the sample through the finite mixture regression. Finite mixture allows to divide consumers into groups by calculating for each individual the probability of belonging to each group while it was tested what type and to what extent personal environmental attitudes and specifically individuals environmental-ecological commitments may influence the WTP for pasta obtained using more sustainable agricultural practices.

3.2.2.1. Contingent Valuation method

In Contingent Valuation, respondents are asked to hypothetically express their willingness to pay for a specific good/service. The WTP, starting from the theory of consumer choices and the maximization of utility, allows measuring the “strength” of the individual's preferences in economic terms for a specific good/service (Bateman, 2002).

With the CV, belonging to the declared preference (SP) methods, it is possible to estimate the value of the WTP for goods/services starting from a hypothetical but realistic scenario (Carson, 2000; Louviere and Hensher, 1982).

One of the strengths of the SP methods consists in this peculiarity, it is possible to make estimates, avoiding the problem of the non-existence of a real market.

This characteristic is also one of the weaknesses due to conflicts relating to the actual ability to measure the "real" values and not those declared. Respondents may underestimate or overestimate the declared values for several reasons, including social acceptability for sensitive issues such as the environment (Boxall et al., 1996; Mitchell and Carson, 1989). To avoid hypothetical or strategic bias it is necessary to recreate a scenario that is perfectly understandable to the interviewees and use the cheap talk method (Cummings and Taylor, 1999; Murphy et al., 2005)

In this study, statements aimed at contextualizing the scenario were included in the survey to minimize bias, also providing clear information on the more sustainable agricultural practices referred to. The contingent valuation method derives the maximum value that respondents were willing to pay through an open question.

3.2.2.2. *Finite mixture regression*

Contingent valuation allows to measure consumers WTP towards pasta obtained using more sustainable agricultural systems. To understand to what extent personal attitudinal factors may influence consumers preferences towards this product, the finite mixtures (FM) regression approach has been specifically implemented. This method has been recently used in market segmentation studies (Caracciolo et al., 2022), allowing to detect detailed group-specific pattern of preferences of consumers. Betrail and Callavet (2008) implemented FM to estimate the demand for fruit and vegetables, while Caracciolo and Furno (2020) analysed implicit prices of wine attributes. FM is a data-driven approach, wherein the data clustering process is made simultaneous to the regression estimation process. In our case, since consumers heterogeneity, being characterized by different socio-demographic characteristics, while their social factors might differently influence the WTP, similar individuals are grouped in distinct groups sharing similar demographic characteristics and functionally similar patterns of preferences towards more sustainable pasta. Empirically, FM adaptively models multiple regressions, each one responsible for one subset/cluster of the data the sample, computing the coefficients of the regression model within each group. The estimation procedure is based on the Expectation-Maximization (EM) algorithm (Dempster et al., 1977), allowing the estimate of class-specific coefficients without prior information on the clustering.

By considering the wtp_i function of a set of personal attitudinal factors $\mathbf{x}_1$ of the i^{th} individual that is characterized by $\mathbf{x}_2$ socio-demographic characteristics, in a sample of size n , the maximum likelihood objective function, which provides the maximization step, relates wtp_i to $\mathbf{x}_1$ and is given by

$$\prod_n \pi_{ij} f(wtp_i | x_{i1}, z_i = 1) \quad (1)$$

Where π_{ij} is the probability of observation $i=1, \dots, n$ to belong to a given group $j=1, \dots, K$, K is the number of endogenously determined groups in the model, and z_i is a non-observable latent variable determining for each observation its involvement in one group or another. The likelihood combines the conditional likelihood of each latent class weighted by the associated latent-class probability. For each observation, the probability of inclusion in group j , π_{ij} , is function of z_i , which assumes values 0 or 1 to define the exclusion or the inclusion of the i^{th} observation in the specific j^{th} group

$$\pi_{ij} = \pi(z_i = 1) = \exp(z_i) / \sum_{j=1, K} \exp(z_i) \quad (2)$$

Equation (2) yields the expectation step of the algorithm.

Unfortunately, it is unknown from which group an observation is drawn, the observed sample is incomplete since z_i is an unobservable latent variable. However, z_i can be approximated by the set of variables, x_{2i} . A multinomial logit model computes π_{ij} as follows:

$$\pi_{ij} = h(x_{ij}) = \exp(g(x_{i2})) / \sum_{j=1, K} \exp(g(x_{j2})) \quad (3)$$

where $g(x_{i2})$ is the function relating the probability of being in the j class to the x_{i1} characteristics.

Next, the linear model explains the dependent variable wtp_i as a function of the social factors in x_{i1} . The EM algorithm allows the contemporaneous estimation of the probability to belong to a group π_{ij} together with the regression coefficients β_j in each the K groups, breaking the objective function iterating between the estimated expected probability of belonging to a specific group, $E(\pi_{ij})$ in (3), and the estimates of the regression coefficients for each group $\hat{\beta}_j$ in (1).

3.2.2.3. Survey design and Ecological Commitment Index

The survey develops with a questionnaire structured in several sections. Given the study aims, the first block included several questions regarding the degree of involvement in agricultural systems and rural landscapes of the interviewees. Furthermore, the level of knowledge for more sustainable agricultural practices was investigated.

The second section was introduced by an incipit that contextualizes the Contingent Valuation hypothetical scenario. CV included an open question⁴ in which the interviewees were asked to declare

⁴ “What is your maximum willingness to pay for the purchase of Durum wheat semolina pasta from more sustainable agricultural systems? (€ / month)”

their maximum willingness to pay for pasta produced with raw materials, durum wheat, obtained from the more sustainable agricultural systems illustrated in the incipit. The value was expressed in €/month.

The third block consisted of questions regarding the main socio-economic variables, such as sex, age, family size.

The fourth section investigated the interviewees' personal attitudes towards the environment. Understanding these factors is essential to define the factors that influence individuals about this topic. The measurement and interpretation of this aspect is not an easy task. Various scales, developed in the literature, can evaluate different aspects of attitude towards the environment (Cruz and Manata, 2020). For the research, in addition to some multiple-choice questions, a series of items were included referring to the degree of ecological commitment based on the scale proposed by Maloney et al. (1975). The Environmental Commitment Index (ECI) develops in three different sub-categories (Table 1): affective commitment (ECI-A), which investigates the feelings generated by environmental problems, verbal commitment (ECI-V), concerning declarations on willingness to act to solve these problems, and real commitment (ECI-R), which analyzes the actions implemented to solve this issue. Respondents were asked to rate their degree of agreement with each statement on a five-point Likert scale from 1 (totally disagree) to 5 (totally agree). Individuals who present higher values, therefore a better attitude towards the environment, should be the most interested in sustainability attributes on the food products.

Table 1: *Environmental Commitment Index (ECI) items*

ECI	Item	Likert scale
		(1 totally disagree) 5 (totally agree)
ECI-A	When I think of the damage to nature (plants / animals) caused by pollution, I feel irritated	1-5
	I would like sustainable agriculture to be promoted	1-5
ECI-V	I would like to stop buying products from companies that pollute the environment even at the cost of paying for more products	1-5
	I would be willing to participate in voluntary activities and environmental education	1-5
ECI- R	I always choose certified sustainable, ecological or organic products	1-5
	I collaborate with environmental organizations (voluntary, donations, etc.)	1-5

The questionnaire was submitted in March 2019 for a pilot test to 15 people. In May 2019, it was distributed with face-to-face interviews and a random sampling method in the municipalities of Parma, Reggio Emilia and Modena. The places selected were public spaces such as squares, parks, city centres and suburbs at different times of the day. The final sample comprises 185 individuals chosen through the random choice of one person for every three passers-by.

3.3. Results

3.3.1. Sample description

The characteristics of the interviewed sample are shown in Table 2. The respondents have an average age of 47 and around 51% are women. Almost 50% of the sample has a medium level of education, i.e. a diploma or equivalent qualifications.

The residence location variable shows rurality in which the interviewees are "included", almost 90% of the sample lives between the city center and residential districts. 55.68% own fields directly or through family members, but only 41% of the sample regularly visit agro-ecosystems. Despite this, 80% are aware of the main sustainable agricultural practices. A first descriptive analysis relating to the open question used for the CV shows the sample present an average WTP of 3.6 €/person/month for pasta with sustainability attributes.

Concerning the variables related to environmental attitudes, the interviewees declared their commitment through a five-point Likert scale. The ECIs, as present in other studies in the literature (Zabala et al., 2022), decreased as the required commitment increased, from 4.84 for affective commitments (ECI_A) to 3.40 for verbal commitments (ECI_V) up to 2.02 for real actions (ECI_R).

Table 2. *Descriptive Statistics*

Variable	Sample
Gender (% women)	50.81
Age (years)	47.46
Educational level (%)	
<i>Lower level</i>	21.08
<i>Medium Level</i>	49.19
<i>Higher level</i>	29.73
House-Hold size (people)	2.87
Residence location (%)	
<i>City center</i>	32.97
<i>Residential district</i>	55.68
<i>Urban-peripheral</i>	4.86
<i>Rural area</i>	6.49
Fields propriety	55.68
Sustainable agricultural practices awareness	81.6
Visit agro-ecosystems	41.6
WTP sustainable pasta mean (€/person/month)	3.646
ECI_A (mean)	4.843
ECI_V (mean)	3.403
ECI_R (mean)	2.022

3.3.2. *Finite mixture model results*

Akaike's information criterion (AIC) and Bayesian information criterion (BIC) were used to determine the optimal number of classes, K (Caracciolo and Furno, 2020). The best fit was identified in the sample's subdivision into 4 classes (K = 4). Tables 3, 4, 5 show the estimates, respectively, of the factors determining the probability of belonging to each group, of the role played by the environmental attitudes on the WTP for sustainable pasta, and of the distribution of the main variables for each group. Table 3 shows the probabilities coefficients belonging to each class. Group 2 is the reference group. Estimates show that in determining the classes, mainly variables such as age or family size take over, while Fields propriety and sustainable agricultural practices awareness have no influence. Looking at each group, in the first, the individuals are younger and have a smaller family size than the reference group. In class 3, membership is determined by education level (lowest), residence location (closer to the city center) and household size (slightly larger). Group 4 is mainly composed of women, younger and with a larger family than group 2.

From table 4 it is possible to deduce that group 1 includes individuals whose willingness to pay is strongly influenced, positively, by the sentiments towards environmental problems that are, in part, reduced by the actions taken to fight these problems. Group 1 has the highest average WTP, around 6 €/person/month and includes around 13% of the sample. These individuals are those who are strongly impressed by the environmental problem and who are inclined to address the environmental concern by purchasing products with a sustainability label on the shelf. It can define group 1 as “The emotional”. As Tab 5 shows, in this class, there are mainly men of about 41 years of age and an average level of education. These individuals live mainly in the city center but still have a good awareness of sustainable agricultural practices. Considering the environmental attitudes described on the 5-point Likert scale, this group has an almost maximum attitude in sentiments towards environmental problems (4.90), a verbal commitment equal to 3.43 and a higher value of the actions taken to fight these problems compared to other groups.

Group 3 WTP amounts to approximately 2.50 €/person/month. Environmental attitudes weakly influence the willingness to pay for sustainable pasta. In particular, the verbal willingness to act to solve environmental problems is contrasted, with almost equal value, by the negative influence of the actions taken. Given these characteristics, group 3 can be defined as “The disinterested”. This is the second group in terms of importance, as it contains 24% of the respondents. Group 3 individuals have a medium/low education level, are distributed equally between men and women and are on average about 50 years old. “The disinterested” is closely related to agro-ecosystems as more than half are landowners, have an excellent knowledge of sustainable agricultural practices but have, as already defined above, low values concerning environmental attitudes.

Groups 2 and 4 have quite similar WTP values. Group 2, which is also the most numerous (41% of the sample), has a value of 3.50€/person/month. Group 4 is about 3.40 €/person/month and includes 22% of the interviewees. Despite this, attitudes influence WTP in different ways. In Group 2, this value is positively influenced by sentiments and willingness to act to solve environmental problems, but this “momentum” is mitigated by the actions taken. Given the contrast between what has been declared and what has been done, Group 2 can be defined as “The hypothetical”. Observing the variables that characterize this class in tab 5, these individuals concerning age and gender are distributed similarly to “The indifferent”. The education level of group 2 is medium and they have an excellent knowledge of agricultural practices. These individuals live mainly in the city center and residential districts and have a family size of 2/3 people. Environmental attitudes values, also, in this case, decrease starting from the sentiments towards environmental problems up to the actions taken to resolve these issues. In Group 4, observing the influence of environmental variables on WTP, we can define this as the

group of “The activists”. It can deduce that these individuals prefer to act actively (positive influence “real commitment”) rather than making statements (negative “verbal commitment”).

From tab 5 it is observed that “The activists” are mainly women of about 40 years. They have a medium/high level of education and a larger family size than the other groups (4/5 individuals). Again, more than half are landowners and have excellent knowledge of sustainable agricultural practices. The “activists/concrete” towards environmental attitudes has a value almost equal to the maximum value concerning feelings towards environmental problems and high values also for verbal intentions concerning these issues. They have a high value, the second after "The emotional", concerning the actual actions taken to address these problems.

Table 3. *Factors estimates determining the probability of belonging to each group*

	Group 1			Group 3			Group 4		
	Coef.	Std.Err	p-value	Coef.	Std.Err	p-value	Coef.	Std.Err	p-value
Gender	-1.296	1.039	0.212	0.450	0.507	0.374	<i>2.187</i>	<i>1.198</i>	<i>0.068</i>
Age	<i>-0.078</i>	<i>0.044</i>	<i>0.080</i>	0.003	0.020	0.892	<i>0.110</i>	<i>0.057</i>	<i>0.054</i>
Educational level	0.015	0.989	0.988	<i>-1.554</i>	<i>0.530</i>	<i>0.003</i>	1.534	1.323	0.246
Fields propriety	-0.599	1.183	0.613	0.356	0.489	0.467	0.614	1.039	0.555
Sust_agr_pract	-0.438	1.208	0.717	0.627	0.740	0.397	-0.156	1.601	0.923
Residence locat	-0.511	0.688	0.457	<i>-0.653</i>	<i>0.391</i>	<i>0.095</i>	-0.563	1.071	0.599
hh_size	-2.705	<i>1.027</i>	<i>0.008</i>	<i>1.039</i>	<i>0.459</i>	<i>0.024</i>	<i>3.823</i>	<i>1.045</i>	<i>0.000</i>
Constant	9.885	5.773	<i>0.087</i>	-0.296	2.542	0.907	-22.799	8.198	<i>0.005</i>

Note: Group 2 is the reference group; values in italics and in black color are statistically different from zero ($p < 0.10$).

Table 4. *WTP sustainable pasta estimates within each group and their probabilities*

	Group 1 – The emotional			Group 2 – The hypothetical			Group 3 – The disinterested			Group 4 – The activist		
	Coef.	Std.Err	P>z	Coef.	Std.Err	P>z	Coef.	Std.Err	P>z	Coef.	Std.Err	P>z
<i>Wtp_Sustainable pasta</i>												
cfa_eciA	<i>14.441</i>	6.398	<i>0.024</i>	2.579	0.507	0.000	0.014	0.008	0.101	1.843	1.148	0.108
cfa_eciV	-3.516	4.500	0.435	<i>3.567</i>	<i>1.410</i>	<i>0.011</i>	0.037	0.018	0.037	-	2.141	0.023
										<i>4.854</i>		
cfa_eciR	<i>-5.304</i>	2.478	<i>0.032</i>	<i>-2.516</i>	0.370	0.000	-	0.007	0.001	2.548	0.586	0.000
							<i>0.024</i>					
_cons	6.293	0.975	0.000	<i>3.540</i>	0.151	0.000	<i>2.489</i>	0.003	0.000	3.395	0.183	0.000
π	0.13	0.31		0.41	0.43		0.24	0.42		0.22	0.38	

Values in italics and in black color are statistically different from zero ($p < 0.10$).

Table 5. *Main variables by group (avg. share)*

	Group 1 – The emotional		Group 2 – The hypothetical		Group 3 – The disinterested		Group 4 – The activist	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Gender	0.30	0.46	0.50	0.50	0.51	0.50	0.65	0.48
Age	41.34	15.71	50.60	18.25	51.88	22.53	40.43	14.11
Educational level	2.31	0.76	2.06	0.67	1.68	0.65	2.44	0.55
Fields propriety	0.50	0.50	0.51	0.50	0.60	0.49	0.64	0.48
Sust_agr_pract	0.71	0.45	0.83	0.37	0.88	0.33	0.78	0.41
Residence locat	1.58	0.82	1.88	0.86	1.77	0.63	2.04	0.72
hh_size	1.45	0.65	2.51	0.87	2.84	1.00	4.43	1.04
WTP sust pasta	6.30	4.42	3.51	1.45	2.49	0.02	3.55	1.24
ECI_A	4.90	0.25	4.85	0.39	4.75	0.46	4.90	0.25
ECI_V	3.43	0.81	3.41	0.72	3.31	0.76	3.48	0.54
ECI_R	2.27	0.79	1.98	0.51	1.90	0.70	2.09	0.37

Looking at the average WTP results of the total sample, 3.64 €/person/month, some general considerations can be made. From a comparison with the ISTAT data (ISTAT, 2018) for the average monthly expenditure for “pasta and couscous” equal to 4.86 €/person/month, be seen the data emerged from the survey is over 1€ lower. The sustainability attribute in a product destined for mass-market and with low added value is still difficult to evaluate by the average consumer. Although these results are highlighted by the 4 groups, it can be observed that in their purchase process for a common product of the Italian tradition, they move with different preferences.

Sensitivity to the environmental issue, measured through the ecological commitment index, is combined with other factors resulting in diversified groups. This process is strongly influenced by the household size, which concerns the availability of expenditure of the interviewees. For example, although Group 4 has a pronounced environmental sensitivity, with values very close to “The emotional”, it has an average WTP 3 points lower than group 1. It can observe how with increasing age there is less of lower sensitivity to the environmental issue, especially a low propensity to act directly. Groups 2 and 3 have a higher average age and lower ECI index values.

What emerged has clear implications both from a political point of view and in marketing strategies for pasta industry companies, which will be discussed in the conclusion paragraph.

3.4. Conclusions

An increasing number of consumers know current consumption patterns have a strong impact on natural resources. Considering the drive towards sustainable consumption and the demand for agro-food products created with this ethics, supply chains are responding by modifying their processes.

These changes entail higher costs and efforts by all actors involved, primarily farmers who should implement sustainable practices in their cultivation plans.

From a market point of view, agri-food companies are equipping themselves with labels or items capable of highlighting the sustainability attribute of the products coming from these systems.

The recognition by consumers of the higher value incorporated in this type of product could help all stakeholders to see, in part, their effort remunerated.

The present study addressed this issue by trying to understand if some factors, such as environmental attitudes linked to ecological commitment, influenced this recognition process, which can be translated into a higher willingness to pay. The pasta was chosen as the object of the analysis as low added value product but at the heart of the Italian culinary tradition and the Mediterranean diet.

Overall, respondents showed they were unwilling to pay more for pasta labelled with the sustainability attribute.

In other words, the average consumer is not willing to pay more for public goods provision, generated by implementing more sustainable agricultural practices from which the raw materials of the product are derived, through the increase in prices for commodities.

If we analyse other variables, we can observe differentiated attitudes for subgroups of the sample of interviewees.

Specifically, environmental attitudes, through the ecological commitment assessment, show there are consumers interested in the issue, who have a higher WTP, and others who prefer to act not through the market, therefore buying sustainable products but committing themselves first line in other activities.

Starting from these results, some cautious considerations can be outlined in both political and marketing terms.

If companies want a “premium price” recognized by a larger share of consumers for the effort generated by producing more sustainably, they must invest in specific communication strategies. This goal can be achieved by acting with awareness campaigns aimed to transfer sustainability value and higher commitment. Awareness-raising concerning environmental issues, as it emerges, from the analyses seems to have already begun in the younger generations. It would allow, over time, bringing a change in the way of understanding these issues for an increased number of consumers.

From a political point of view, we consider these processes to take time, while the transition of production systems towards sustainability has already begun. In this perspective, besides investing in raising awareness of the environment in society, it is necessary to develop political tools and strategies that can support the players in the supply chain in the process of change. Agricultural producers who, in this perspective, often radically change their production systems. It should be added that in Europe, policies such as the CAP have already been acting in this direction for years and the commitment to sustainability is the heart of the latest reform.

4. CHAPTER 4

4.1. Discussion of main findings

Il settore agricolo negli ultimi anni sta vivendo un profondo cambiamento orientato dalle richieste della società rispetto alla sostenibilità. I modelli di produzione agricola altamente specializzati e vocati alla produzione di cibo prodotto con logiche di produzione industriale hanno generato negli anni numerosi problemi ambientali. L'utilizzo di colture ad alto rendimento, incremento della meccanizzazione, alto utilizzo di agro-farmaci sono annoverabili come le principali cause di fenomeni di inquinamento dei sistemi idrici, degrado dei suoli e perdita di biodiversità. La presa di coscienza da parte della collettività che questa gestione intensiva degli agro-ecosistemi genera impatti sulle risorse naturali ha aumentato le pressioni sulla classe politica che sta accettando l'idea di avviare una transizione a modelli di business differenti. Il passaggio a sistemi produttivi più sostenibili da un lato mira a ridurre le esternalità negative e dall'altro ad aumentare la fornitura di servizi ecosistemici.

La società grazie ai flussi generati dagli agro-ecosistemi riceve, direttamente o indirettamente, una serie di benefici. La crescente consapevolezza di queste interconnessioni ha spinto, da un lato, i cittadini a chiedere alle politiche di impegnarsi e supportare il percorso verso sostenibilità e, dall'altro, i consumatori a adottare stili e scelte di consumo più sostenibili.

Nel panorama europeo l'UE ha rafforzato i suoi impegni in questo percorso comunicando ai suoi cittadini, tramite il New Green Deal e la nuova riforma PAC, una forte spinta alla transizione dei sistemi agricoli europei verso metodi di gestione più sostenibili.

Dall'altra parte il mercato, tramite un profondo processo di cambiamento delle filiere sta cercando di rispondere alla richiesta di prodotti agro-alimentari sostenibili dei consumatori.

Entrambi questi percorsi hanno un minimo comune denominatore di partenza che risiede nel passaggio a sistemi agricoli più resilienti e sostenibili.

In questo contesto l'obiettivo del presente lavoro è stato individuato nell'analizzare la riconoscibilità da parte degli individui rispetto ai benefici che questa tipologia di agrosistemi genera per la collettività. La stima è stata effettuata individuando il valore attribuito in termini di disponibilità a pagare per tali benefici.

Volendo fornire un quadro di analisi più completo l'utilizzo di metodi SP ha permesso di approfondire questo tema tramite due diversi approcci e visioni.

Innanzitutto, è stato analizzato il valore ipotetico attribuito ai servizi ecosistemici, generati da sistemi agricoli più sostenibili. Gli agro-ecosistemi presi come riferimento erano conformi alle linee guida delle nuove e rivisitate GAEC presenti nella riforma PAC 23-27. In questo caso il punto di vista preso

in esame è quello della società che chiede impegno e supporto alle politiche riguardo alla sfida della sostenibilità.

Successivamente le analisi si sono focalizzate sul valore ipotetico assegnato ad un prodotto agro-alimentare con attributo di sostenibilità. Questo approccio si basa sulla visione dei consumatori rispetto agli sforzi introdotti dagli operatori delle filiere agroalimentari per rispondere ad una crescente domanda di questa tipologia di attributi intangibili nei prodotti di largo consumo.

Per effettuare queste stime entrambe le metodologie sono state applicate allo stesso campione di persone. Gli intervistati hanno risposto con la loro duplice natura, prima come cittadini poi come consumatori. La survey ha interessato una specifica area, la Pianura Padana. Questa zona è stata scelta in quanto vi risiede circa il 70% della produzione agricola italiana e i modelli di produzione intensiva implementati hanno prodotto forti impatti sulle risorse naturali.

Partendo dalla valutazione dei beni pubblici, il campo di indagine è stato circoscritto all'analisi di alcuni strumenti previsti dalla nuova PAC ovvero alle riformulate GAEC. In questo lavoro abbiamo focalizzato l'attenzione su 3 di queste: la GAEC 5 riguardante l'adozione di strumenti per la gestione dei nutrienti, la GAEC 8 sull'adozione della rotazione colturale (che sostituisce la richiesta di diversificazione colturale a favore di un requisito più restrittivo) e la GAEC 9 che richiede azioni per il mantenimento di aree non produttive per l'aumento della biodiversità.

Le analisi sviluppate attraverso un choice experiment e l'utilizzo di diverse metodologie hanno portato a delineare diversi scenari ipotetici in cui gli agro-ecosistemi implementavano e combinavano le diverse GAEC andando a generare differenti flussi e livelli di servizi eco-sistemici. Questi hanno mostrato come i cittadini presentino WTP diverse a seconda degli ESs considerati; in generale sono disposti a pagare per sostenere la transizione a sistemi di produzione più sostenibili e il valore attribuito aumenta all'aumentare del livello di fornitura dei servizi ecosistemici.

Inoltre, il confronto tra questo valore e quello trasferito dalla PAC, sotto forma del contributo della quota Greening, ha evidenziato un surplus a favore delle stime dei cittadini rispetto ai reali conferimenti delle politiche.

Nell'ottica di comprendere se tale valore fosse trasferibile, tramite meccanismi transazionale di filiera, ai diversi attori per compensare gli sforzi sostenuti nell'ottica della sostenibilità si è sviluppata l'analisi del terzo capitolo. Tramite il punto di vista degli stessi intervistati, stavolta in veste di consumatore, si è proceduto alla stima del valore ipotetico attribuito ad un prodotto di largo consumo e poco differenziato, prodotto con materie prime provenienti da agrosistemi conformi ai requisiti delle sopraccitate GAEC. L'indagine è stata effettuata analizzando la disponibilità a pagare per pasta di

semola di grano duro con attributo di sostenibilità elicitata tramite lo sviluppo di una contingent valuation.

In questa ottica si è cercato di comprendere se alcuni fattori dell'individuo influenzassero valori più alti di WTP per prodotti sostenibili. Tra questi sono state analizzate le attitudini ambientali misurate tramite la scala di impegno ecologico. I risultati hanno evidenziato come nel complesso il consumatore medio non è disposto a pagare di più per un prodotto a basso valore aggiunto come la pasta, anche se con un attributo di sostenibilità. Sono stati comunque osservati atteggiamenti positivi in specifici sottogruppi di consumatori più sensibili alle tematiche ambientali. Si può dedurre da questi risultati che il consumatore medio non è disposto a sostenere la transizione dei sistemi agricoli tramite prezzi più alti dei prodotti agro-alimentari sostenibili, almeno nel caso di prodotti di largo consumo come la pasta.

I risultati dei due casi studio, per quanto il campione non sia rappresentativo della popolazione, restituiscono risultati in linea con altri studi presenti in letteratura e importanti spunti di riflessione di carattere generale.

La sfida alla sostenibilità è stata accettata dai policy-maker e dai mercati alla luce anche delle pressioni della collettività, preoccupata dagli impatti che la gestione intensiva degli agro-ecosistemi ha generato sulle risorse naturali. Da parte della società vi è una chiara richiesta di modificare gli attuali sistemi di produzione a favore di altri in grado di generare un maggiore flusso di servizi ecosistemici, ovvero che parteciperebbero in modo positivo all'incremento del benessere degli individui.

Dalle analisi si evidenzia però una marcata scissione tra quanto dichiarato dalle persone in quanto cittadini e dagli stessi individui in quanto consumatori. L'attenzione e il valore attribuito direttamente ai servizi ecosistemici (beni pubblici) è ben maggiore rispetto alla disponibilità a pagare per un prodotto di mercato sostenibile (bene privato).

Gli individui prestano maggior attenzione al bene pubblico ma non trasferiscono tale interesse ad un bene privato che racchiude nell'attributo di sostenibilità tali valori. I cittadini riconoscono l'importanza dei servizi ecosistemici nella partecipazione al loro benessere ma non sembrano tradurre tali valori in una maggiore WTP come consumatori per l'acquisto di prodotti che nel loro essere hanno contribuito all'aumento della disponibilità di ESs.

La società in via ipotetica delinea le richieste a cui dovranno rispondere i policy-maker, tramite politiche, strategie e strumenti, quindi di fatto giustifica e approva l'impegno di una parte rilevante dei fondi europei per sostenere il percorso di transizione ecologica. Nel caso analizzato, non sembra invece essere il mercato capace di monetizzare il valore della transizione ecologica in una misura adeguata a

compensare i mancati redditi o maggiori costi sostenuti dagli operatori (agricoltori in primis) in questo cambio di rotta.

Dal punto di vista del mercato vi è la necessità di “educare” i consumatori sulle cause della sostenibilità riportata in etichetta, ovvero degli “sforzi” aggiuntivi richiesti agli attori della filiera per ottenere un prodotto sostenibile competitivo sullo scaffale.

L’eterogeneità e la mutevolezza delle aspettative dei consumatori rispetto ai valori del cibo hanno portato brand e retailers a sviluppare claim e certificazioni veicolate da una moltitudine di etichette, comunicazioni di sostenibilità differenti che possono causare una difficoltà nella comprensione da parte del consumatore, ovvero che potrebbero contribuire a creare confusione nell’affiancare concetti quali cibo di qualità/agricoltura sostenibile/prezzi. Questo sembra essere ancora più evidente per prodotti a basso valore aggiunto e poco differenziati dove le scelte di acquisto sono ancora fortemente condizionate dal rapporto qualità-prezzo e fedeltà al brand.

Alla luce di tali risultati e lo sforzo sostenuto dal settore agricolo per la transizione verso la sostenibilità, sarebbero auspicabili ulteriori studi volti ad approfondire alcuni degli aspetti evidenziati dal presente lavoro in quanto potrebbero essere utili ad arricchire la ricerca in questo ambito e fornire indicazioni utili in chiave politica e di marketing.

5. ACKNOWLEDGMENTS

The author acknowledges the support of the EU H2020 Diverfarming — Grant Agreement 728003 project in the development of this doctoral thesis.

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