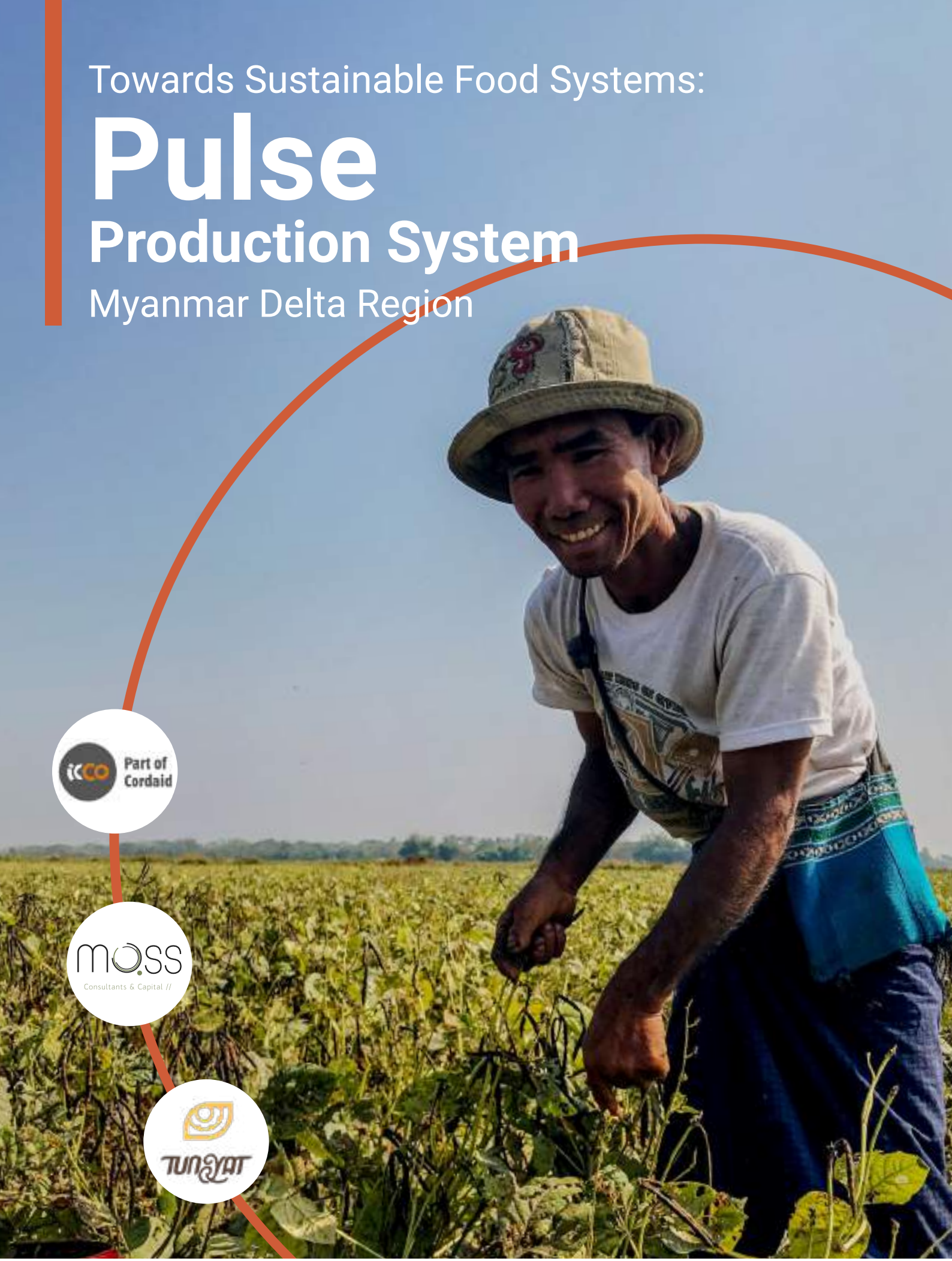
Towards Sustainable Food Systems:

Pulse

Production System

Myanmar Delta Region



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TUNGYAT

Civic Engagement Alliance

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Contributors

Sander Fleuren, Editor
MOSS Consultants & Capital

Bram Peters, Editor
ICCO Cooperation

Myat Hla Sandar, Researcher
Tunyat

Than Htike Soe, Researcher
Tunyat

Hujjat Nadarajah, Researcher
Tunyat

Chayanat Supasongklod, Designer
MOSS Consultants & Capital

ABOUT THIS REPORT

The United Nations' (UN) Zero Hunger Challenge is a vision for inclusive and sustainable food systems that accentuates the interdependence between elements of the Sustainable Development Goals (United Nations, n.d.). This vision underlines a need to understand the current dynamics between all the elements and activities that relate to the production, processing, distribution, preparation and consumption of food and the outputs of these activities, including socioeconomic and environmental outcomes (United Nations, 2015). It explicitly emphasizes that a sustainable food system is a dynamic process, and context-dependent (United Nations, 2015). Only by understanding these complex, contextual interdependencies can a pathway towards sustainable food systems be developed in such a way that the economic, social and environmental bases to generate food security and nutrition for future generations are not compromised.

However, in a globalized world with many complex drivers it may be difficult to pinpoint exactly where opportunities are for stakeholders to change the way a system operates and how negative effects might be mitigated. This also stems from the understanding that there is no one solution to tackling these issues nor one way to address agricultural and dietary transitions. Systems thinking offers an approach to generating such a holistic perspective, the insights of which can lead to actionable strategies for realizing systems change. Indeed leading change agents and agencies are increasingly calling for systems approaches to systemic challenges (see e.g.: Ashoka, 2020; Cannon, 2019; Kirsch et al., 2016; WBCSD, 2021).

This report outlines the findings of a 6-month research partnership under the Civic Engagement Alliance, funded by the Netherlands Ministry of Foreign Affairs, between ICCO Cooperation, Tun Yat, and MOSS Consultants & Capital, in applying systems thinking tools to investigate the pulse production system of Myanmar's Ayeyarwady Delta region. It functions as a strategic document that identifies key leverage points in the system at which to design, improve, and scale systems interventions towards a sustainable food system, while bearing in mind various potential unintended consequences. It further illustrates how the adoption of systems thinking methodologies can help shift stakeholder perspectives on food systems and inform cross-sector collaborations for realizing systems change. As such, it intends to catalyze practitioners into becoming systems change leaders and adopting a holistic and multi-stakeholder approach to achieving sustainable food systems.

#changethesystem

Point of Note: Coup

The disruptions caused by the illegal seizure of power by the Tatmadaw on February 1st, 2021 directly impeded the continuation and completion of this research partnership, to the extent that only **a small portion of the findings** could be presented in this report. This is reflected - and further expounded upon in the Points of Note - in the *Leverage Points* and *Change Strategies* chapters (Chapter 3 and Chapter 4 respectively).

Civic Engagement Alliance

This is a project of the Civic Engagement Alliance, a lobby and advocacy program focusing on Indonesia, Cambodia, and Myanmar funded by the Netherlands Ministry of Foreign Affairs. Its aim is to decrease inequality and injustice in these countries through partnerships by improving inclusive and sustainable value chains and strengthening responsible business (with a focus on agriculture and forestry). For more information, see www.civicengagementalliance.org

Chapter 01:

SYSTEM FUNDAMENTALS

A system is a set of variables that are interconnected and collectively produce their own pattern of behavior over time

(based on: Meadows, 2008).

Scope & Boundary

Systems thinkers use a synthetic approach to tackling complex problems that emphasizes viewing them as part of larger problems rather than by taking them apart (Ackoff, 1974). To do this, systems researchers set boundaries to focus their investigation to a manageable scale that simultaneously does not overlook crucial system dynamics while sufficiently incorporating context-specific details.

Myanmar's pulse food system is complex, contains sub-systems, and is itself a sub-system of yet larger systems. For example, pulses are grown in roughly 40% of Myanmar's arable land but across significantly different agro-ecological regions, as distinguished by differences in rainfall, temperatures, elevation, and soil types (Ministry of Agriculture Livestock and Irrigation [MOALI], 2017). Differences in agro-ecological systems translate into significant differences in pulse food systems between the two principal pulse-growing regions: the Central Dry Zone (32%) and the Delta Zone (68%) (MOALI, 2017). In dry areas prone to drought such as the Central Dry Zone, pulses are grown as a monsoon crop due to their ability to enhance soil water conservation through their shallow rooting-depth and high water-use efficiency (Aung & Ahramjian, 2020; Gan et al., 2015). Conversely, farmers in wet areas prone to flooding such as the Delta region engage in pulse-growing after the harvest of the main rice crop due to the sufficient residual soil moisture in the 3-4 month, post-monsoon winter season (Aung & Ahramjian, 2020). These stark differences in pulse food systems necessitate a system boundary selection along agro-ecological lines.

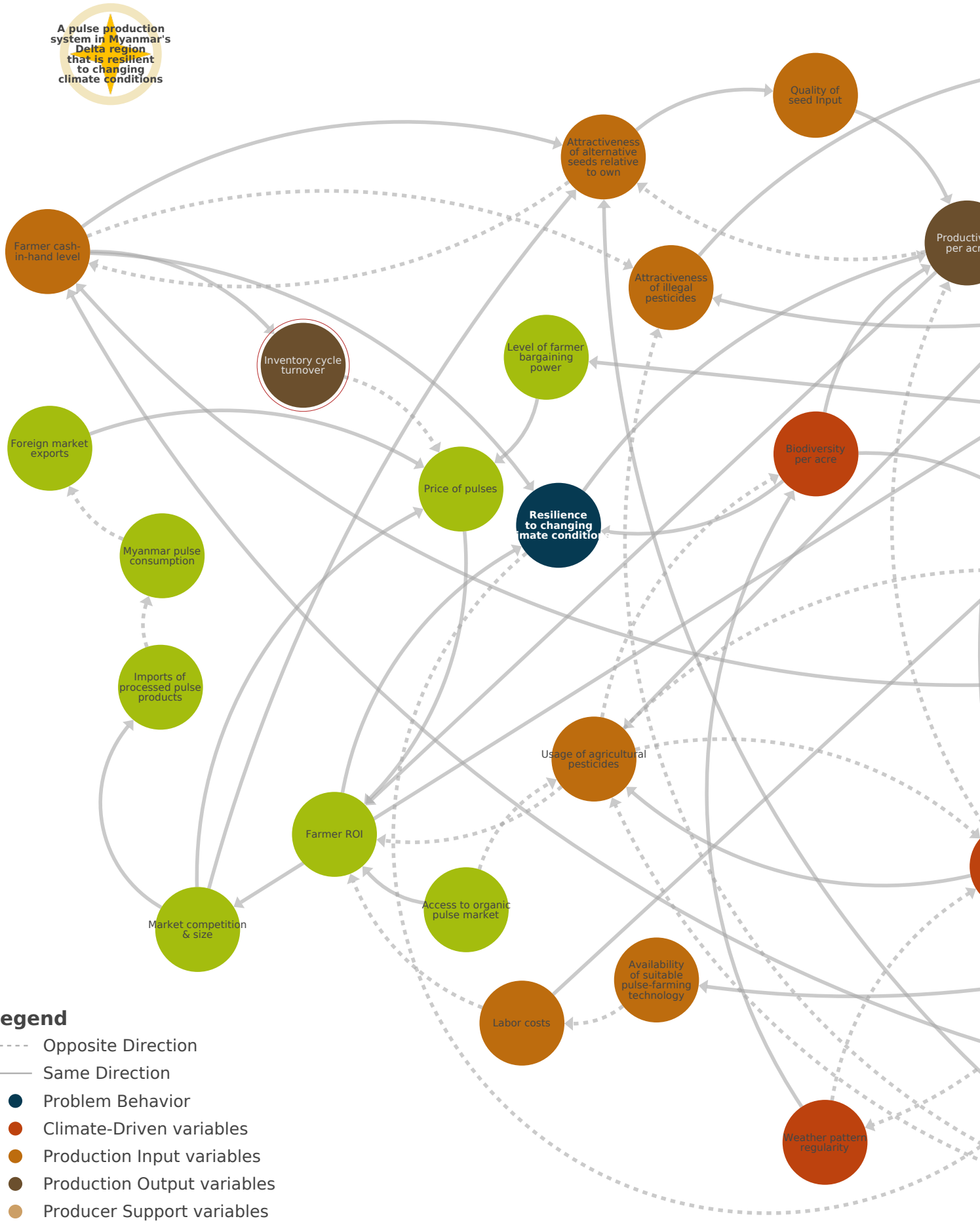
In line with their operational objectives as well as the water-management implications of growing pulses in wet regions, the project partners identified the Delta region of Myanmar - encompassing the Yangon and Ayeyarwady regions - as the agro-ecological boundary of this research project. Given the current productivity levels and intercropping practices of pulse farmers in the Delta region, the project partners further specified one of the core food system activities (van Berkum et al., 2018) - production - as the focal system scope of this research project.

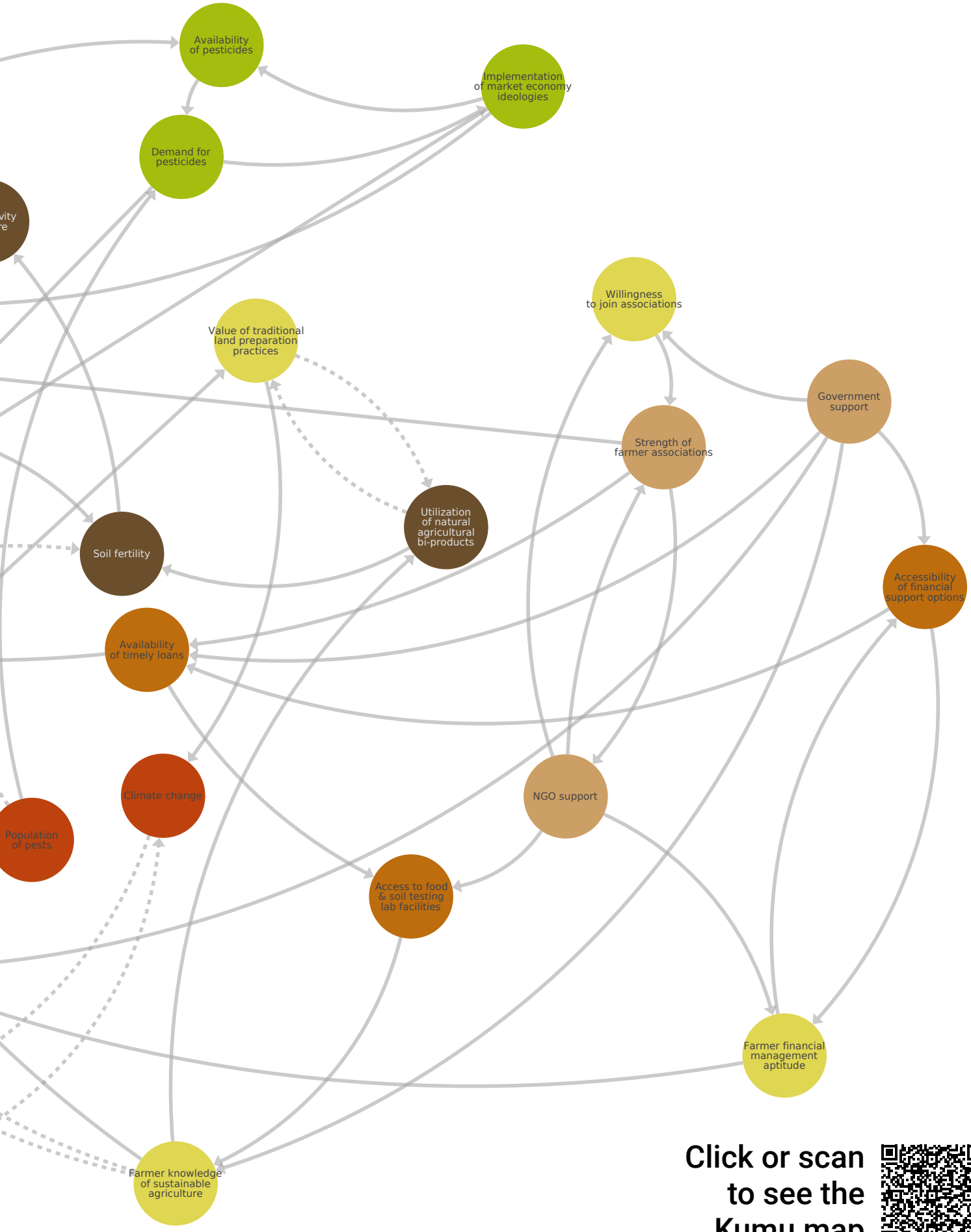
The practicable insights generated are therefore based on research from, and relevant for, the pulse production system in Myanmar's Delta region.

Profile

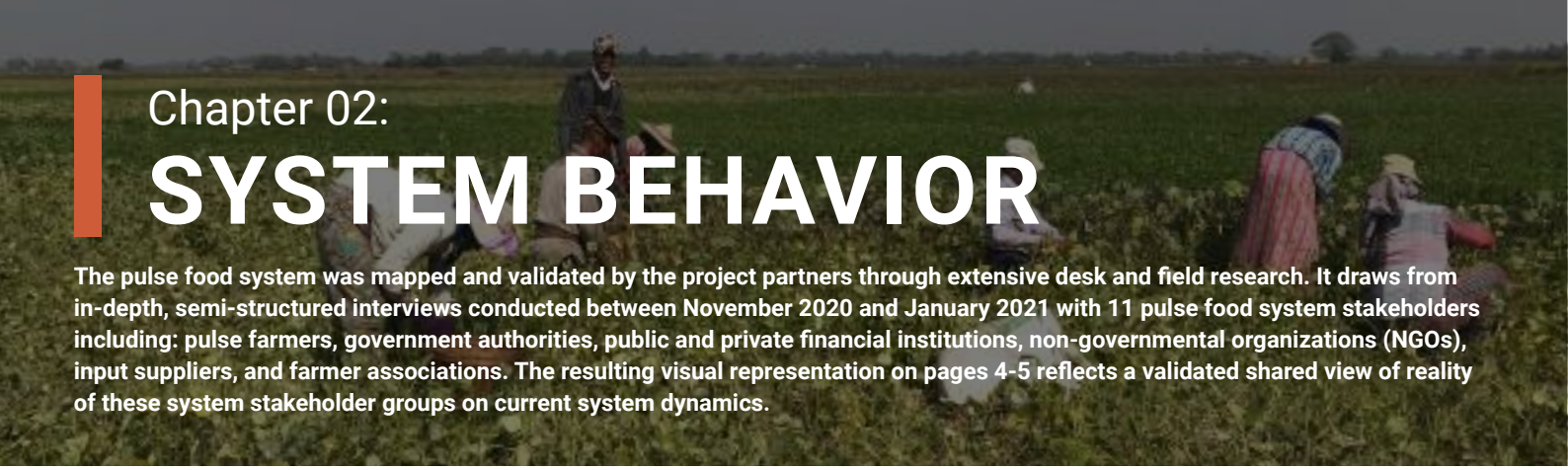
Pulses, defined as "edible legumes including dry beans, peas and lentils (MOALI, 2017: p.7)", are Myanmar's largest export in value and volume, accounting for 7% of global pulse production (Oxford Business Group, 2018b). Producers of pulses benefit from Myanmar's extensive land, water, and labor resources, as well as proximity to fast-growing neighboring economies - India, China, Bangladesh, Thailand, Laos - that are also Asia's largest consumers of pulses (Ahmed et al., 2019; MOALI, 2017; Raitzer et al., 2015). Consequently, Myanmar has a significant export dependency on these economies and the industry is vulnerable to trade or commerce shocks (Boughton et al., 2015; Laitha, 2020). Nevertheless, pulses are also the second most important crop for local consumption, due to their high nutritional value that includes dietary proteins, fibre, vitamins, and minerals (MOALI, 2017; Mudryj et al., 2014). This domestic demand has increased as a consequence of the sector's liberalization between 1988 and 2010, with an emerging focus on secondary processing towards higher value-added products such as: noodles, soup, flour, powder, and animal feed (Boughton et al., 2015; Laitha, 2020; MOALI, 2017; Mudryj et al., 2014).

Myanmar has approximately 3 million pulse farmers that collectively produce over 24 types of pulses, of which the dominant pulse species in terms of production and area sown are black gram (or Matpe) and green gram (or mung bean) (Boughton et al., 2018; MOALI, 2017). The Delta region, specifically, produces roughly 70% of these species and is a driving force behind Myanmar's position as a top-five producer of pulse crops (MOALI, 2017). Producers of these pulses benefit from higher prices though suffer from higher costs of production relative to other crops and pulse species (Ahmed et al., 2019; Laitha, 2020; MOALI, 2017; Oxford Business Group, 2018b). As a result, farmers in this region commonly rotate or intercrop pulses with rice (Ahmed et al., 2019; MOALI, 2017). This highlights the importance of pulses in the Delta cropping system, indicating how farmers diversify their cropping practices by capitalizing on the soil-enrichment qualities of pulses and recognizing its socio-economic value (Gan et al., 2015; MOALI, 2017).


A pulse production system in Myanmar's Delta region that is resilient to changing climate conditions
Quality of seed Input
Attractiveness of alternative seeds relative to own
Farmer cash-in-hand level
Attractiveness of illegal pesticides
Inventory cycle turnover
Level of farmer bargaining power
Foreign market exports
Biodiversity per acre
Price of pulses
Resilience to changing climate condition
Myanmar pulse consumption
Imports of processed pulse products
Usage of agricultural pesticides
Farmer ROI
Access to organic pulse market
Market competition & size
Availability of suitable pulse-farming technology
Labor costs
Weather pattern regularity
Legend
Opposite Direction
Same Direction
Problem Behavior
Climate-Driven variables
Production Input variables
Production Output variables
Producer Support variables
Producer Knowledge variables
Market Condition variables



Click or scan to see the Kumu map



Chapter 02:

SYSTEM BEHAVIOR

The pulse food system was mapped and validated by the project partners through extensive desk and field research. It draws from in-depth, semi-structured interviews conducted between November 2020 and January 2021 with 11 pulse food system stakeholders including: pulse farmers, government authorities, public and private financial institutions, non-governmental organizations (NGOs), input suppliers, and farmer associations. The resulting visual representation on pages 4-5 reflects a validated shared view of reality of these system stakeholder groups on current system dynamics.

Problem Behavior

The interaction of the variables that make up a system, and their interconnections, constitute the system dynamics from which system behavior emerges (Kim, 1999; Meadows, 2008). Systems practitioners seek to change system behavior, implying that the current system behavior is dysfunctional, unhealthy, or problematic. In line with the UN's vision for sustainable food systems, this project focuses on environmental sustainability issues within the pulse production system.

The adverse effects of climate change on agriculture is well-documented globally (see e.g.: Adams, 1989; Arora, 2019; Aydinalp & Cresser, 2008; Carter et al., 2018; Gornall et al., 2010; Jat et al., 2016; Kim, 2008; Mendelsohn, 2000; Morton, 2007; van Jaarsveld & Chown, 2001; Vermeulen et al., 2012), influencing agriculture and food production directly through changes in agro-ecological conditions and having an outsized effect on households that depend on agriculture (Food and Agriculture Organization [FAO], 2011; World Bank Group, 2014). This underscores the urgency for environmental resilience in food systems for Myanmar's agriculture-dependent economy (FAO, 2021). Indeed, Myanmar ranks among the world's top countries most at risk from the combined effects of climate change: "The country is already experiencing increased climate variability (notably with regard to rainfall), is significantly exposed to extreme events (notably destructive cyclones), and is expected to experience increased temperatures, heavier rains but also longer dry spells with fast growing impact in the coming decades (World Bank Group, 2014: p.42)".

Currently, this combination of weather and climate-related shocks makes Myanmar's Delta region particularly vulnerable to changing climate conditions. Ten percent of the coastal region is projected to be affected by a sea-level rise of up to five meters, which will inundate arable land with seawater (FAO, 2011; Oxford Business Group, 2020a; SeinnSeinn et al., 2015; World Bank Group, 2014). In addition, warmer temperatures in the area will increase evaporative loss of surface water resources, leading to higher fresh water scarcity (FAO, 2011). Expected increases in aggregate rainfall as well as variability in rainfall events will also lead to more frequent and more severe floods and droughts in the area, threatening 36% of the coastal population (Ahmed et al., 2019; FAO, 2011; MOALI, 2017; World Bank Group, 2014). Moreover, the region is highly vulnerable to hydroclimatic extremes such as cyclones, likely to have disastrous consequences for the pulse food system (FAO, 2011; World Bank Group, 2014). Indeed, according to the Global Climate Risk Index (Eckstein et al., 2020), in 2020 Myanmar was identified as the second most affected country by extreme weather events worldwide.

Pulse farmers in the Ayeyarwady region are already having to contend with the adverse effects of climate change (Ahmed et al., 2019; SeinnSeinn et al., 2015). Starting with rainfall volatility, farmers are increasingly grappling with season unpredictability which is already having an impact on crop productivity and leading to pre/post-season crop losses (Ahmed et al., 2019; FAO, 2011; Mar et al., 2018; Oxford Business Group, 2020a; Sandar, 2021). This has destructive knock-on effects that intensify the climate change impacts in an accumulative manner. For example, high pulse seed moisture content at harvest reduces the seed quality input for the following season, and thereby the yield and quality of the harvest, which is also problematic in terms of food safety (Ahmed et al., 2019; Silakul & Jindal 2002). Coupled with temperature increases, conditions have also become ripe for rampant crop diseases and pests, resulting in yet more crop losses (Ahmed et al., 2019; Aung, 2021; SeinnSeinn et al., 2015; World Bank Group, 2014). While managing these risks in the short term, the resulting excessive use of agrochemicals by pulse farmers has long-term effects on community air and water quality, further exacerbating climate change (Ahmed et al., 2019; Lwin, 2021; Oxford Business Group, 2020a).

Significant rises in flooding, drought, and extreme events such as cyclones (notably Mala in 2006, Nargis in 2008, and Giri in 2010) have further decimated pulse crops and placed extreme pressure on fresh water supplies (FAO, 2011; World Bank Group, 2014). This has ushered in a new dimension of vulnerability in rural livelihoods, whose food and seed stocks have increasingly been destroyed or washed away (FAO, 2011). In the past years, pulse farmers have been subjected to a combination of stresses such as low yields, price shocks, and higher production costs, leading to loss of income and acute food insecurity and placing further pressures on the productivity of this important pulse-production zone (Ahmed et al., 2019). Over time, this pattern has manifested into less varied diets and acute malnutrition among coastal communities, as well as inconsistencies and shortfalls in government support (FAO, 2011; Nyunt, 2020).

It is clear, therefore, that climate change has enormous effects on the pulse production system, and will continue to do so as long as the Delta region remains vulnerable to changing climate conditions. Recent World Wildlife Fund (WWF) research confirms that Myanmar's climate is expected to change dramatically in the coming decades, indicating that tackling environmental sustainability issues by adapting and mitigating their impact within the pulse production system is crucial to reducing its vulnerability to climate change (Horton et al., 2017).

Guiding Star

Given the current state of the system as epitomized by the problem behavior, an imagined future state of the system that is functional, healthy, or problem-free can be formulated. This so-called Guiding Star serves as a shared vision for system stakeholders to rally behind, guiding them in their system change efforts. As the pulse production system in Myanmar's Delta region is currently vulnerable to changing climate conditions, the Guiding Star for this research project is: *A pulse production system in Myanmar's Delta region that is resilient to changing climate conditions.* In this context, resilience is defined as the system's adaptive capacity to absorb stresses from climate change and to adapt, reorganize, and evolve into configurations that improve its sustainability (Folke, 2006; Nelson et al., 2007).

Point of Discussion: A Shared Perspective

Systems change is necessarily participatory – it requires a concerted effort from multiple stakeholders to tackle the root causes of problem behavior. Unfortunately, when it comes to complex adaptive problems such as climate change and food security, stakeholders often don't see eye-to-eye on the root causes (Vidal, 2021). Sharing a view of current reality as well as a vision for the future are powerful benefits of a systems mapping approach that includes multiple stakeholders. By continuing to include key stakeholders of food systems whose perspectives of the system's problems are vital to generating new directions, insights, and change efforts, systems practitioners can align resources and initiatives needed to realize systems change.

Central Narrative

The pulse food system map on pages 4-5 provides a visual representation of the system dynamics leading to the current problem behavior, as represented by the variable: **Resilience to changing climate conditions**. Such maps can be difficult to understand at first glance by parties not involved in the mapping process. A central narrative helps to clarify the visualisation by outlining the core nodes - or groups of variables that share characteristics - and relationships in the map that explain system behavior.

The level of resilience to changing climate conditions of the pulse production system derives from the interdependencies between a number of variable nodes, namely:

- Climate-Driven variables
- Production Input variables
- Production Output variables
- Producer Support variables
- Producer Knowledge variables
- Market Condition variables

Climate-Driven variables such as weather patterns and biodiversity levels influence the soil fertility and productivity of farmland which are **Production Output** variables. These are in turn influenced by feedback processes between **Production Inputs** and **Market Conditions**, wherein the size and competitiveness of the pulse market (including export and import demand) determine the price of pulses as well as the price, availability, and attractiveness of various inputs such as seeds, labor, and pesticides. However, **Producer Support** variables such as association, government, and NGO assistance modify pulse producers' capacity to navigate changing conditions by influencing their access to inputs including finance, machines, and lab facilities, as well as by regulating **Producer Knowledge** (including values and skills) of sustainable agriculture, financial management, and land preparation traditions. The interdependencies of these nodes and the subsequent degree to which these variables interact ultimately indicate the extent to which the system is capable of adapting to and absorbing climatic shocks, and thereby the system's resilience to changing climate conditions.

Chapter 03:

LEVERAGE POINTS

Not all places to intervene in a system are equally effective. There are places in a system where a relatively minor intervention can lead to relatively major changes (Meadows, 2008). Such places of high leverage - or, leverage points - can be differentiated still further by their degree of effectiveness, contingent on their transformative capacity (Fischer & Riechers, 2019; Meadows, 1997). As shown in Figure 3.1, the most transformative leverage points are those that influence the underlying values, rules, and world views that are embodied within system structures while the least transformative leverage points are those that modify only the mechanistic feedback characteristics of a system (Abson et al., 2017). This is because such deeper system characteristics (i.e. paradigms and mindsets) that inform design and intent leverage points, shape and constrain the shallower system characteristics (i.e. material stocks and flows) that inform material parameter and feedback process leverage points (Fischer & Riechers, 2019).

In practice, leverage points are not mutually exclusive and can be interpreted differently by different stakeholders, based on their own perspective of the system; where one stakeholder might intervene at a place in the system to change a material stock or flow another might intervene at the same place to influence the underlying values (Fischer & Riechers, 2019). As such, leverage points can be loosely classified in three categories (see *Types of Leverage* section), but are always contingent on the perspective and intended intervention of system stakeholders.

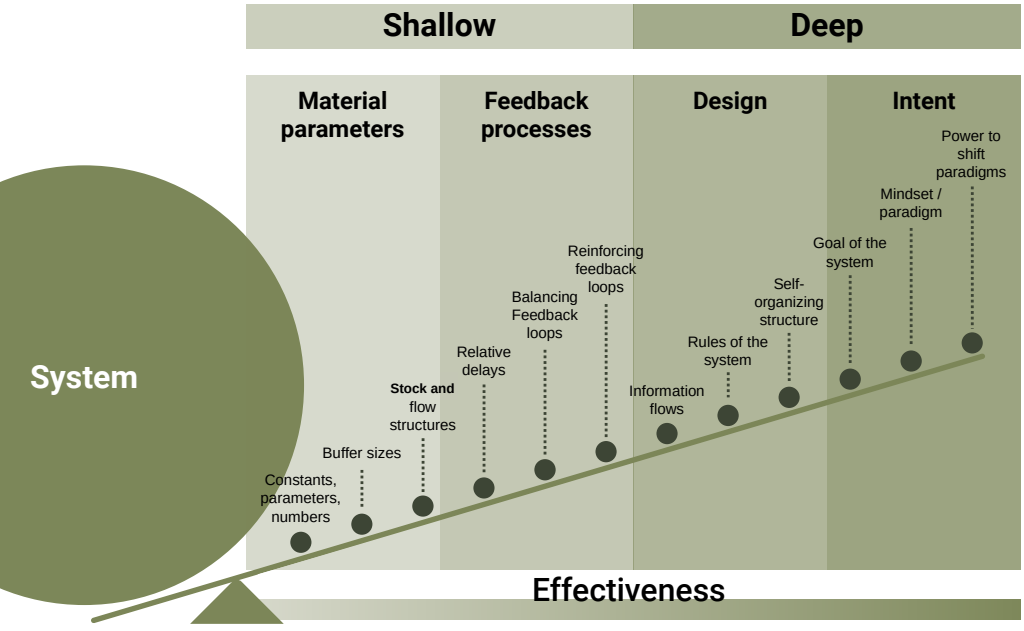


Figure 3.1: Leverage Point Effectiveness
(based on: Abson et al., 2017; Fischer & Riechers, 2019; Meadows, 1997)

Point of Discussion: Protecting Vulnerabilities

While leverage points offer valuable opportunities for stakeholders seeking to change system behavior, they are also vulnerabilities that, if not protected, may succumb to opposite forces and lead to more dysfunctional system behavior. This is because most systems consist of a multitude of stakeholders whose objectives are not aligned with each other, which manifests into forces exerting opposing pressure in the system. In fact, often the most effective interventions at points of high leverage are those that mitigate existing counterforces to the intended objective. (Meadows, 1997; Stroh, 2015)

All leverage points indicate places where forces and counterforces exert pressure on system dynamics. These forces often originate from the agency of system stakeholders, indicating that at any given time, the net actions of each stakeholder are working to move the system towards or away from a given behavior. (Kok et al., 2021; Meadows, 2008)

Leverage points are therefore extremely valuable to systems practitioners. They help identify the various stakeholders active in a system as well as their relative influence and disposition, information useful to making strategic collaboration decisions. In addition, leverage points help to identify and evaluate intervention opportunities, by envisaging their influence on system dynamics. This includes the consideration of potential system changes that may be unexpected and even run counter to the intended objective of interventions (Kim, 1999).

The following leverage points were identified as critical points of high leverage in the pulse production system at which to design, improve, and scale system interventions towards a sustainable food system. These were identified using insights from three rigorous systems analyses - Limits of Current Solutions, Performance Gaps, and Enablers & Inhibitors* - and cross-checked with leverage point efficacy theory.

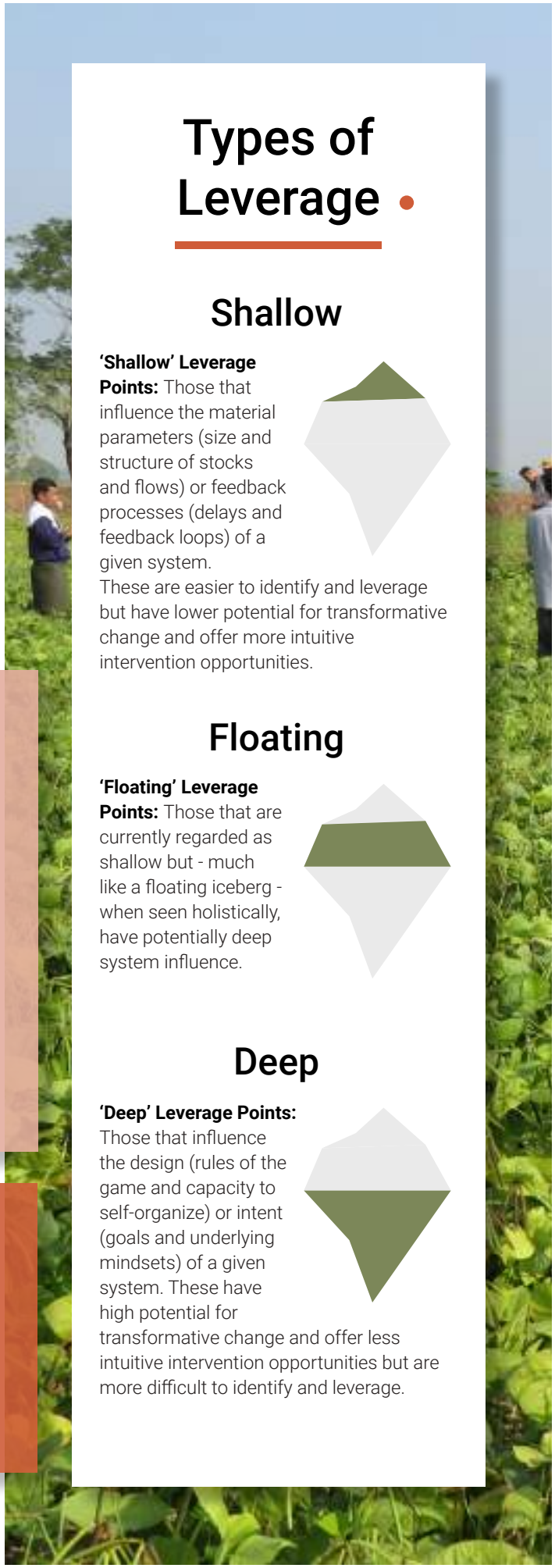
Point of Discussion: The Power of Leverage

The relative power of stakeholders to effectuate change at points of high leverage ultimately determines the direction of systems change. The consequences of the illegal seizure of power by the Tatmadaw on February 1st, 2021 illustrates this effect. The Tatmadaw has exercised its influence on all the identified leverage points in this report in an attempt to control system infrastructures. Consequently, the people of Myanmar have embraced their own collective strength and countered military pressure with collective defiance at key leverage points in the system. From a systems perspective, the resulting changes to Myanmar's social, economic, and political systems are a lesson in the value and strength of leverage points. See for example: Duangdee (2021); Frontier Myanmar (2021); Reuters (2021).

Point of Note: Missing Leverage

The disruptions caused by the illegal seizure of power by the Tatmadaw on February 1st, 2021 directly impeded the continuation and completion of this research partnership, to the extent that only a small portion of the findings could be presented in this report. Only **three out of ten** identified leverage points, for example, are outlined in this chapter. Please refer to this Kumu systems map for a concise overview of all ten leverage points.

**contact MOSS for more information on the conducted systems analyses or see Maps 3-5 in this Kumu systems map for a brief overview.*



Types of Leverage

Shallow

'Shallow' Leverage Points: Those that influence the material parameters (size and structure of stocks and flows) or feedback processes (delays and feedback loops) of a given system.
These are easier to identify and leverage but have lower potential for transformative change and offer more intuitive intervention opportunities.

Floating

'Floating' Leverage Points: Those that are currently regarded as shallow but - much like a floating iceberg - when seen holistically, have potentially deep system influence.

Deep

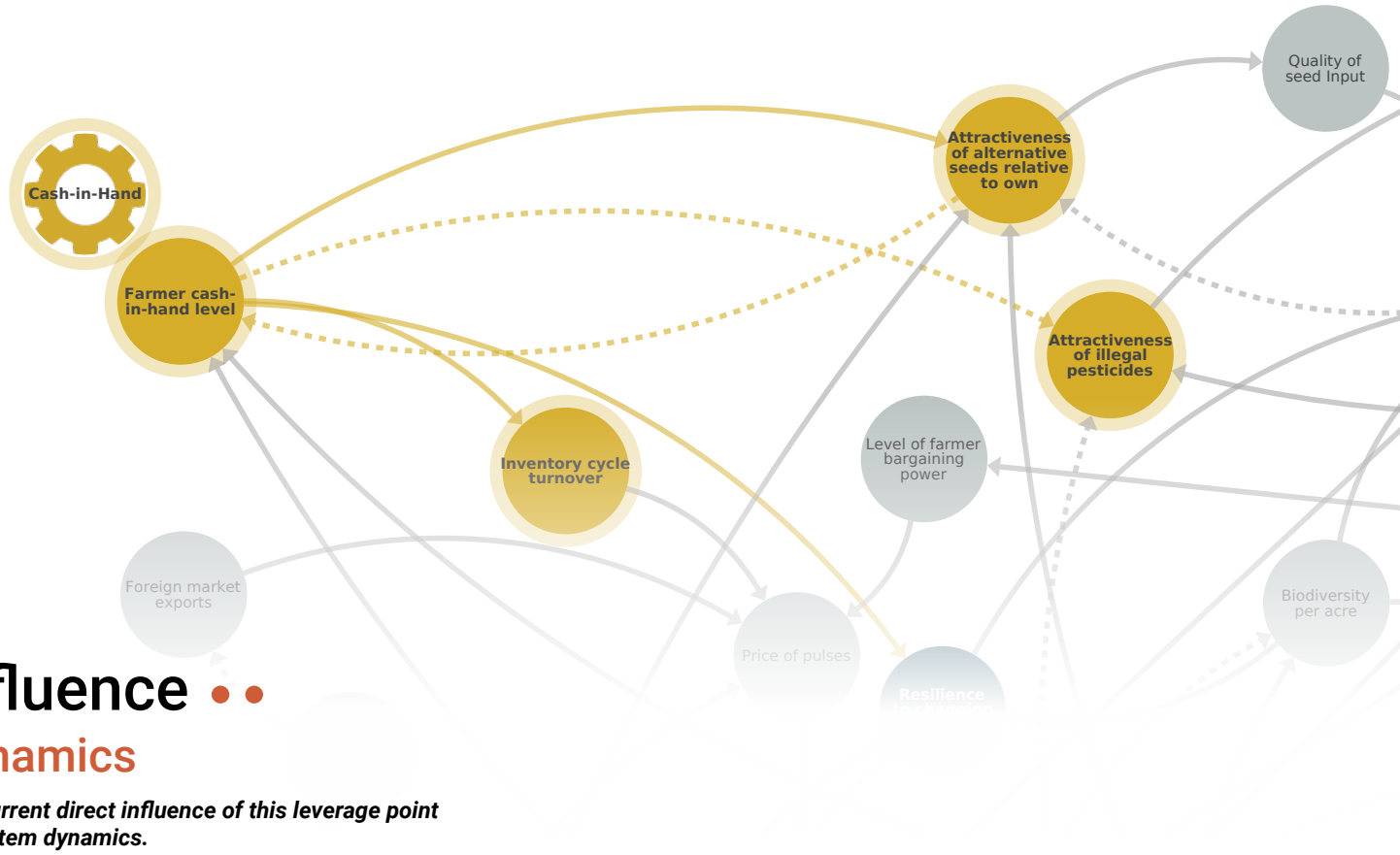
'Deep' Leverage Points: Those that influence the design (rules of the game and capacity to self-organize) or intent (goals and underlying mindsets) of a given system. These have high potential for transformative change and offer less intuitive intervention opportunities but are more difficult to identify and leverage.

LEVERAGE POINT: 01 OF 10

Cash-in-Hand

Description

Cash-in-Hand refers here to the amount of fiat currency that is available for farmer expenditure. Cash flow is currently season-dependent, fluctuating as farming households meet subsistence requirements between harvests. According to farmers, the amount of cash that they have available at any time is therefore a critical factor as it significantly influences their planning horizon, expenditure decisions, and ability to adjust to changes. (Aung, 2021; Khaing, 2021; Oo, 2021, Phyo, 2021a)



Influence

Dynamics

The current direct influence of this leverage point on system dynamics.

When leveraging *Cash-in-Hand*, the amount of cash available for farmers is predominantly influenced, as represented by the **Farmer cash-in-hand level** variable in the system map. This variable has a number of direct connections and interconnections with other variables, indicating the immediate systemic influence of this leverage point.

Inventory cycle turnover – According to the World Bank, farm profits from harvests are not sufficient to raise households' per capita income above the regional rural poverty line (Luna-Martinez & Anantavrasilpa, 2014). With insufficient cash-in-hand to meet subsistence requirements as well as a lack of suitable storage facilities, farmers are forced to sell their harvest inventories immediately as a means to generate cash flow, thus influencing inventory cycle turnover (Khaing, 2021; Laitha, 2020; Oo, 2021; Oxford Business Group, 2018b). This pressure to increase cash-in-hand by maintaining a high inventory cycle turnover is further compounded by the farmers' need to repay loans that they regularly take out to finance operation costs for pulse production, often at high interest rates (Khaing, 2021; Phyo, 2021a). Increasing cash-in-hand would allow farmers to optimize inventory sales with market prices without compromising loan repayments or subsistence requirements.

Attractiveness of alternative seeds relative to own & **Attractiveness of Illegal pesticides** – Pulse farmers indicate that the amount of cash-in-hand they have influences the decisions they make on operation cost expenditures. When strapped, they are inclined to use their own seeds instead of purchasing qualified seeds from input suppliers and to use low-cost illegal pesticides to reduce operation costs. The amount of cash-in-hand therefore directly influences the attractiveness of both these farming inputs, where higher amounts of cash would lead to improved seed and pesticide use. (Aung, 2021; Laitha, 2020; Oo, 2021; Oxford Business Group, 2017, 2018b, 2020b; Phyo, 2021a)

Resilience to changing climate conditions – Farmer subsistence requirements fluctuate according to changes within the household as well as pressures from outside the household (Leonard et al., 2011). The family life cycle, for example, exerts different pressures over time depending on the individual ages of members of the family unit (Leonard et al., 2011). Changes in climate conditions also influence farmer needs such as food and seed stocks, farm assets, and farming materials (Ahmed et al., 2019; Morton, 2007). New or sufficient resources are therefore often required to accommodate such shifts (Nyunt, 2020; Thorlakson & Neufeldt, 2012). The more resources such as cash-in-hand that are available to farmers, the more resilient they can be to changing climate conditions.

Prohibiting

- **Exporters**
  Are incentivized to maintain high farmer inventory turnover and downward price pressure (unless engaged in contract farming for premium produce), thereby decreasing farmer cash-in-hand levels.
- **Input Suppliers (Pesticides & Seeds)**
  Are incentivized to maintain profits either at expense of or in protection of product quality, thereby decreasing farmer cash-in-hand levels.

Neutral

- **Financial Institutions (Public & Private)**
  Are incentivized to increase farmer cash-in-hand levels in the short-term, with long-term trade-offs.

Supporting

- **Smallholder Farmers**
  Are incentivized to increase their own cash-in-hand levels.

Stakeholders

Current forces that help or support and counterforces that prohibit or hinder healthy system behavior as exerted by stakeholders on this leverage point.

Effectiveness

The current transformative capacity of this leverage point on system behavior.

Influencing the level of farmer cash-in-hand represents a change in the size of a buffer stock, relative to in and out flows. In systems theory, this constitutes a shallow point of leverage as it focuses purely on a mechanistic characteristic of the system rather than its underlying structures or values. In this case, the leverage point influences the amount of cash-in-hand that farmers have, rather than the underlying structures and values in society concerning cash. However, interventions ostensibly aimed at directly influencing cash-in-hand stock and flow levels may function as prerequisites for deeper structural or mindset shifts elsewhere in the system, thereby indirectly leading to more effective systems change. Nevertheless, the effectiveness of *Cash-in-Hand* as a leverage point, while significant, is low relative to deeper leverage points. (Abson et al., 2017; Fischer & Riechers, 2019; Meadows, 1997)

Intervention opportunities

The current intervention opportunities for transformative change at this leverage point.

To build up the stock of farmers' cash-in-hand, interventions can either increase the inflows or decrease the outflows of cash. Directly increasing cash inflows through interventions such as (conditional) cash transfers, grants, and other credit vehicles is a seemingly straightforward option. However, the current system structure facilitates the outflow of farmers' cash-in-hand given the relative dominance of prohibiting counterforces, implying that increasing the inflows of cash is likely to result in a proportionate outflow, thereby limiting its effect. A current opportunity for transformative change at this leverage point, therefore, is to reduce the outflows of cash-in-hand by shifting power and control towards farmers so that they can influence their own planning horizon, manage expenditure decisions better, and adjust more easily to environmental changes and farm regeneration requirements. Intervention opportunities at this point of leverage in the system will therefore involve accelerating the financial management aptitude of farming households that develops their capacity to assess and balance short-term and long-term needs, and better manage investment and expenditure decisions in line with improvements to environmental conditions of pulse farms and farming practices.

Opportunities for intervention at this point of leverage might involve the following approaches:

Pooling community financial resources
One common type of financial mechanism for increasing cash-in-hand for rural or remote households is the establishment of savings-led group models in which a group's collective savings are used to offer loans to group members, such as ROSCAs (Rotating Savings and Credit Associations) and VSLAs (Village Savings and Loans Associations). Such organizations pool financial resources and provide access to working capital either independent of third parties or in cooperation with formal financial institutions or developmental organisations. See for example: Ksoll et al. (2016); ten Hove (2018).

Diversifying income streams
Providing farming households with alternative revenue-generation activities would diversify their income, reduce their reliance on seasonal harvests and market forces, and increase household economic resilience. This includes off-farm employment such as self-employment or local non-farm employment which in the case of surplus labor have been shown to reduce the variance of total income but are often limited by geographic distance to urban centers and requires highly imperfect capital markets to offset substitution effects. See for example: Tao Yang (1997); Woldehanna (2000); Xiaoping et al. (2007).

Strengthening financial wellbeing through women empowerment
A myriad of empirical studies have shown that the inclusion of women in household finances benefits the family's wellbeing, reduces dependency on local money lenders, and leads to significant improvements in income growth. As such, programs that promote women empowerment in farming households through financial literacy and financial inclusion are likely to increase farmer cash-in-hand. See for example: Siddik (2017); Swamy (2014).

Synergizing financial education with digital literacy
By partnering with mobile operators to access hard-to-reach rural locations, a wide range of financial products and services as well as crucial financial management knowledge can be made accessible by funding bodies for farming communities.
When coupled with financial management training, such mobile services can both increase the inflows as well as decrease the outflows of farmer cash-in-hand. See for example: Drexler et al. (2014); Karlan et al. (2016); Kloeppinger-Todd & Sharma (2010).

Unintended Consequences

The potential unintended systemic effects of interventions at this leverage point.

Increasing the cash-in-hand levels of smallholder farmers will lead to multiple unintended systemic effects, some of which may damage the system elsewhere or even counteract the intended problem-free future state of the system.
When designing interventions, stakeholders seeking to intervene at this point of leverage should consider these potential effects in order to mitigate them.
These unintended consequences could include:

Over-indebtedness
Combined with increasing proliferation of credit facilities and the need to meet short-term needs, as farmers become more confident in their financial management abilities they may seek riskier loans, thereby potentially endangering their farm assets or entering multi-borrowing arrangements. See for example: Guérin et al. (2013); McIntosh & Wydick (2005).

Habitat destruction
Reinvesting a surplus of cash-in-hand into farming may lead to a perceived economic need to expand farmland, potentially into natural habitats, thereby destroying the biodiversity of these ecosystems. See for example: Busch, & Ferretti-Gallon (2017); Reside et al. (2017); Volante et al. (2012).

Gender inequality
Extant household gender dimensions of cash management that favor males over females may become more pronounced or form a barrier to economic empowerment if financial management interventions are unequal. See for example: J-PAL (2021); Molyneux (2007); Nagels (2018).

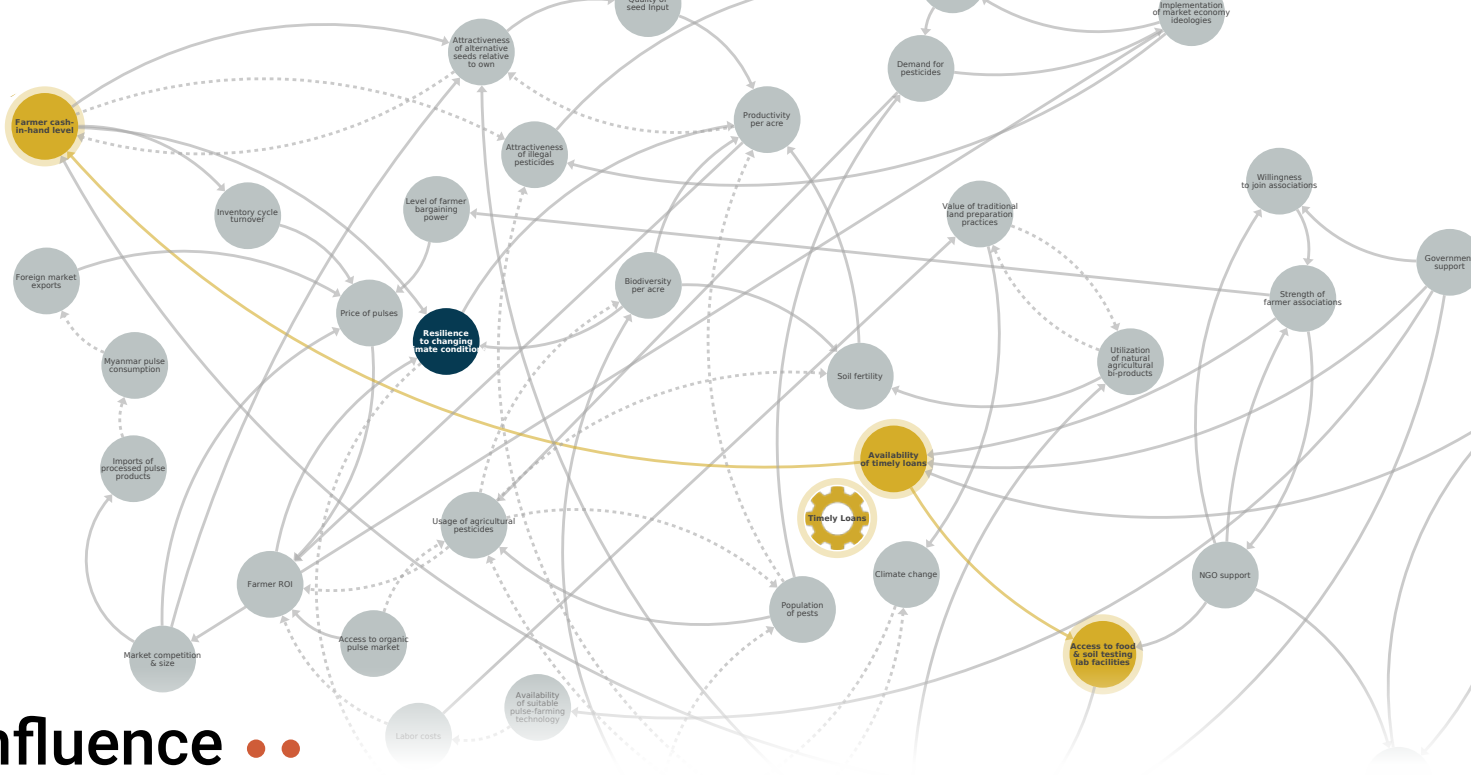
LEVERAGE POINT: 02 OF 10

Timely Loans

Description

Timely Loans refers to the provision of credit facilities at the times and in a manner that aligns with farming resource needs. Access to credit in Myanmar is relatively low, with only about 48% of the population able to sustainably access credit from formal financial services (UNCDF, 2018). Although this represents a significant increase from 30% in 2013, a significant proportion of rural households still depend solely on informal financial services, of which money lenders maintain the highest penetration levels and interest rates (Livelihoods and Food Security Fund [LIFT], 2014; UNCDF, 2018). Loan interest rates in the informal market are declining however, due to increased formal competition in rural markets as banks expand their payment and deposit services (UNCDF, 2018). In agriculture specifically, the state-owned Myanmar Agricultural Development Bank (MADB) is the primary source of funding, providing both collateralized loans for individual farmers with land titles and non-collateralized loans for groups of farmers (Oxford Business Group, 2017, 2020a). The availability and accessibility of credit facilities for pulse farmers is therefore expected to continue to increase in the foreseeable future, particularly if bolstered by government efforts to increase financial inclusion such as the Myanmar Financial Inclusion Roadmap 2019-23 (Oxford Business Group, 2020a).

Nevertheless, pulse farmers indicate that rather than the amount of loans and lines of credit available to them, which is an important facilitator, it is the timing of these loans that is the critical factor in determining their usefulness (Aung, 2021; Khaing, 2021; Phyo, 2021a). Currently, loan application processes with government-backed financial institutions are structured on a seasonal basis without accounting for pre-season land preparation requirements - a critical condition of yield productivity and quality - and are hindered by bureaucratic processes that are difficult to navigate in a timely manner (Oo, 2021; Oxford Business Group, 2017; Phyo, 2021a; Thu, 2021). Indeed, the limited understanding by public financial institutions of smallholder farming practices has restricted product innovation and instead led to standardized loan facilities that do not account for agricultural life cycle requirements (GSM Association, 2018). Private financial institutions such as microfinance institutions (MFIs) have subsequently stepped in to fill this need - expanding by 260% between 2014 and 2019 - as they are not similarly constrained by government budgeting formalities (LIFT, 2017; Oxford Business Group, 2017, 2020a; Phyu, 2020). However, limited access to funds for lending combined with regulatory hurdles such as the inability to offer collateralized loans or set interest rates, has restricted their operation activities (GSM Association, 2018). Farmers therefore have difficulty receiving resources in parallel to important land preparation activities and other farming milestones which significantly influences their agency (Aung, 2021; Khaing, 2021; Phyo, 2021a).



Influence

Dynamics

The current direct influence of this leverage point on system dynamics.

When leveraging *Timely Loans*, the availability of loans commensurate with farming resource needs is predominantly influenced, as represented by the **Availability of timely loans** variable in the system map. This variable has a number of direct connections and interconnections with other variables, indicating the immediate systemic influence of this leverage point.

Farmer cash-in-hand level – According to the World Bank, low-income households engaged in agricultural activities receive a considerable proportion of annual loans provided by financial institutions, indicating a significant reliance on credit for investment and expenditure purposes (Luna-Martinez & Anantavrasilpa, 2014). Indeed, farmers commonly depend on loans to ensure sufficient cash-in-hand for farming activities (Khaing, 2021; Oxford Business Group, 2017; Sandar, 2021).
This dependency indicates that aligning the availability of loans with farming activities would provide farmers with the necessary financial resources at the time that they are most required, thereby increasing farmer agency.

Access to food & soil testing lab facilities – Two widely-used inputs of pulse farming both before and during planting are fertilizer and pesticides, the frequency and quantity of which should be dependent on soil conditions. However, farmers currently lack the data necessary to determine the type, amounts, and frequency of fertilizer and pesticides to apply (Lwin, 2021; Maung, 2021; Oxford Business Group, 2018b). Pulse farmers indicate that they do not receive loans intended to access testing lab facilities in time for seed planting and other critical moments in the farming process (Aung, 2021; Laitha, 2020; Oo, 2021; Phyo, 2021a). This misalignment causes severe productivity losses due to the misapplication of inputs, indicating that timelier loans would increase farmer agency.

Prohibiting

- **Government Sector (Non-Agriculture Ministries)**
  Are incentivized to maximize their budgets in a rigorous, zero-sum annual budgeting process, thereby reducing the timeliness of loans.

Neutral

- **Financial Institutions (Public)**
  Are incentivized to meet farmer credit needs through standardized products that are sector-agnostic, thereby de-prioritizing loan timeliness.
- **Government Sector (Agriculture Ministries)**
  Are incentivized to facilitate all agricultural farmers within annual budget constraints, thereby de-prioritizing sector-specific loan timeliness requirements.

Supporting

- **Smallholder Farmers**
  Are incentivized to apply for and receive loans in time for critical farming activities.
- **Financial Institutions (Private)**
  Are incentivized to fill gaps in farmer credit needs in the short-term, thereby increasing timeliness of loans.
- **Input Suppliers (Pesticides & Fertilizers)**
  Are incentivized to maintain profits by maximizing sales and demonstrating product efficacy, thereby supporting timeliness of loans.

Stakeholders

Current forces that help or support and counterforces that prohibit or hinder healthy system behavior as exerted by stakeholders on this leverage point.

Effectiveness

The current transformative capacity of this leverage point on system behavior.

Influencing the timeliness of loans for pulse farmers represents a parameter change in flow rate from a stock, in this case a credit flow from a financial fund, as well as a structural change in system delays. In systems theory, this constitutes a shallow point of leverage as it focuses on a mechanistic or feedback characteristic of the system rather than its underlying structures or values. Here, the leverage point influences when loans are made to farmers, rather than the underlying structures and values in society concerning loans and agricultural resource requirements. Nevertheless, there is latent potential for deeper systems change along these lines. This is because the value underlying the importance of loan timeliness is that farming is contingent on credit financing. In other words, system structures both reflect and perpetuate a loan-dependency mindset. The effectiveness of *Timely Loans* as a leverage point is therefore potentially high relative to shallower leverage points if leveraged to influence the underlying system structures and values that perpetuate loan-dependency in pulse farming. (Abson et al., 2017; Fischer & Riechers, 2019; Meadows, 1997)

Intervention opportunities

The current intervention opportunities for transformative change at this leverage point.

To facilitate the timeliness of loans, interventions can seek to reduce the delays in lending processes and to align loans with important farming activity milestones for various crops. For example, private financial institutions such as MFIs have already started to meet these financial resource demands by offering more flexible crop-specific loans or smaller activity-specific loans on an ongoing basis (Oxford Business Group, 2017, 2020a; Proximity Designs, 2021). Other current interventions aimed at reducing delays include the opening of more bank branches in rural areas to process loan requests faster or using mobile applications to expedite registration processes (Oxford Business Group, 2017, 2020a; World Bank, 2014; Thu, 2021). A-Bank and MAB, for example, have expanded their operations rurally to provide more agricultural loans to farmers (Kasikornbank, 2020; Thiha, 2018). Given the relative adaptability of the supporting stakeholder forces and relative inflexibility of the neutral and prohibiting stakeholder forces, the current system structure facilitates the focus on such types of intervention opportunities that reduce the delay and/or increase the credit flows to pulse farmers. However, while farmer agency is increased short-term through access to greater financial resources, these interventions do not address deeper loan-dependency structures and values that undermine farmer agency in the long-term. In addition, they do not address climate-resilience directly. A current opportunity for transformative change at this leverage point, therefore, is to disrupt system structures that perpetuate a loan-dependency mindset in agricultural practices and to do so in a manner that reflects the interdependencies between agriculture and environmental sustainability. Intervention opportunities at this point of leverage in the system would thus involve the development of timely alternative methods of meeting farming activity resource requirements in a manner that enhances long-term farmer agency and climate-resilience.

Opportunities for intervention at this point of leverage might involve the following approaches:

Reforming and modernizing the banking sector
Overhauling underlying structures and mindsets in the financial industry that currently limit product effectiveness would not only tackle delays in the provision of farmer loans, but also stimulate financial innovations necessary for climate-resilient agricultural development. Such interventions might include the long called-for privatization of the MADB and diversification of its rice-focused policies and instruments, as well as the reframing of public and private institutional perspectives on agricultural lending risk; by, for example, repositioning farmers as agri-entrepreneurs. If facilitated by data-driven models this could enable the development of tailored financial products that enhance loan utility by aligning credit with farming needs - such as through non-collateralized loans based on farmer profiles or history - or reduce loan-dependency by increasing farmer economic resilience - such as through the extension of formal savings vehicles. See for example: ICCO Cooperation (2017, 2019); UNCDF (2018).

Monetizing farming data
Farming data is a significant underutilized asset given that around 70% of farmers access the internet through their mobile phones (Oxford Business Group, 2020a). The impact mandate and measurement models of agricultural funders such as government entities, agri-business, private financial institutions, and development organizations incentivize them to potentially aggregate and monetize such farming data. Creating new revenue streams for pulse farmers that reward data sharing could disrupt loan-dependency mindsets while enhancing long-term farmer agency and capacity to adapt to climate change, particularly if mechanisms that reward climate-resilient farming are built in. See for example: FairClimateFund (n.d.); Farm-Trace (n.d.); Impact Terra (n.d.).

Facilitating agricultural value chain financing (AVCF)
AVCFs are mutually beneficial partnerships between stakeholders in the agricultural value chain - often in the form of triangular arrangements of buyers, producers, and sellers - that facilitate the application of financial and non-financial tools and technologies to address the needs and constraints of those involved in the chain. Such an integration of various value chain stakeholders has multiple financial benefits for pulse farmers: it encourages both internal and external value chain financial flows and mechanisms that can reduce loan-dependency, opens avenues for access to formal financial services, and provides opportunities for additional agribusiness relationships. In addition, there is enormous upside potential for AVCFs to increase pulse farming climate-resilience if the informed assessments on which they are based lead to the application of climate-resilient strategies across the value chain. See for example: FAO & AFRACA (2020); ICCO Cooperation & NAG (2020); Miller & Jones (2010).

Unintended Consequences

The potential unintended systemic effects of interventions at this leverage point.

Increasing the timeliness of credit facilities for smallholder farmers will lead to multiple unintended systemic effects, some of which may damage the system elsewhere or even counteract the intended problem-free future state of the system.
When designing interventions, stakeholders seeking to intervene at this point of leverage should consider these potential effects in order to mitigate them.
These unintended consequences could include:

Budget shortfalls
As agricultural ministries facilitate faster loan processing, their additional budgetary requirements may be diverted away from other vital parts of the economy such as education, health, and social development. See for example: Deshpande (2018); Shotton et al. (2016).

Market instability
Alternative methods of meeting farmer resource requirements that circumvent existing loan structures may cause instability amongst private financial institutions, threatening their viability in rural areas and jeopardizing their ability to provide financial products and services to various stakeholder groups. See for example: Nehru (2014); Turnell (2006).

Privacy trade-offs
Fintech models exploring alternative credit services such as non-collateral loans often commercialize personal farmer data and may result in privacy infringement if sold to third parties and are susceptible to data breaches if administered at scale. See for example: Schia (2018); Schroeder et al. (2021).

LEVERAGE POINT: 07 OF 10

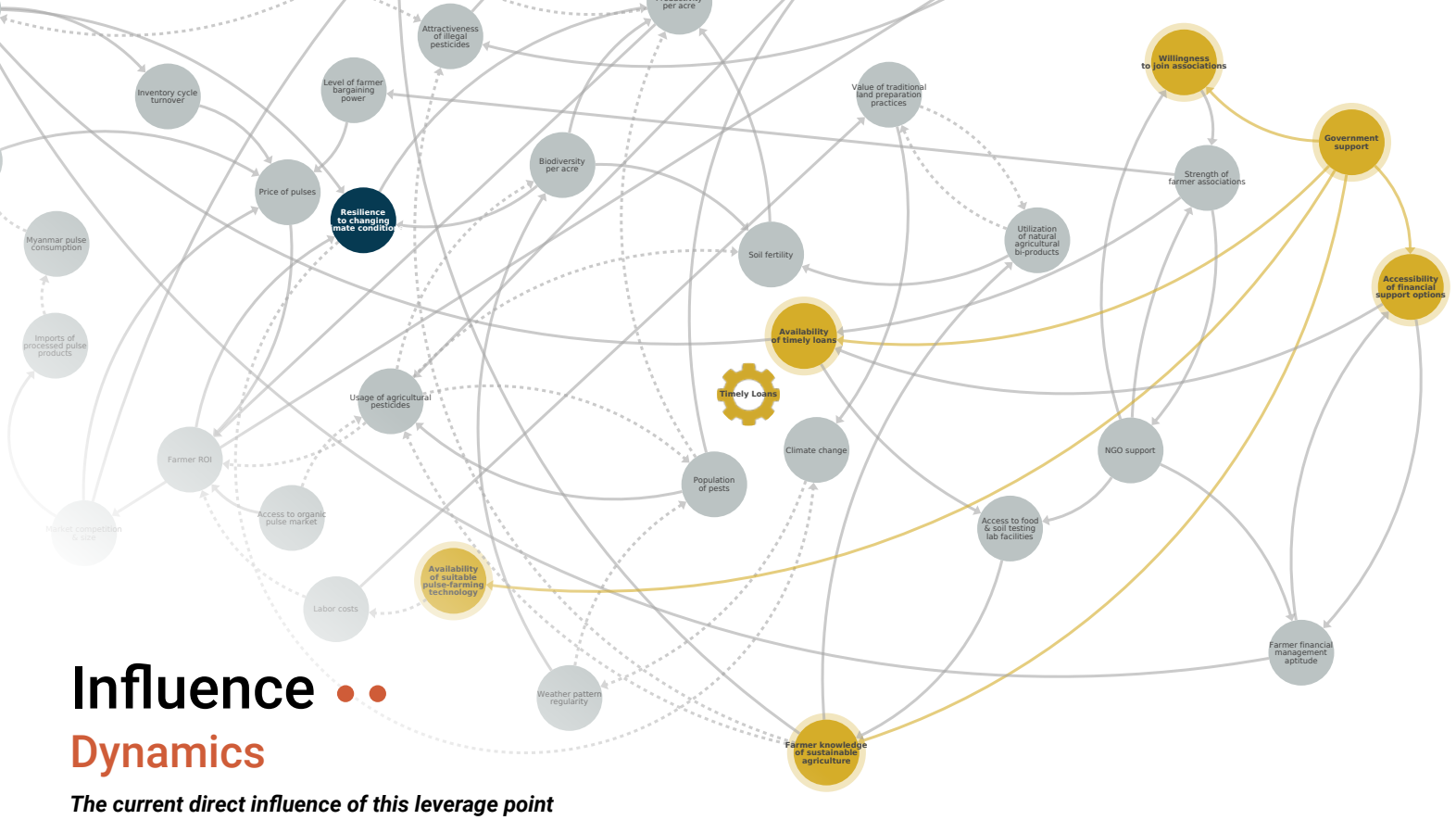
Government Support

Description

Government Support refers to the conditions and resources made available by government entities in support of pulse farming and in alignment with their public fiduciary duties. Resources allocated for agriculture through public spending typically include financial assistance, commonly in the form of subsidies or loans, as well as agronomy advice and other agricultural knowledge, commonly shared through regional training centers and outreach programs (Laitha, 2020; LIFT, 2017; MOALI, 2017). The government agricultural budget allocation has increased gradually in relation to GDP in the past decade and is relatively higher than most developing countries in Asia, though the spending is predominantly focused on irrigation (approximately 50%) while investments in agricultural research only amount to 0.04% (LIFT, 2017). Resource support is administered directly through government or government-affiliated entities such as public banks and universities though also increasingly in collaboration with third parties from the private and nonprofit sectors such as MFIs and international NGOs (LIFT, 2017; Lwin, 2021; Oxford Business Group, 2017; Thu, 2021).

Government Support also extends to the development and maintenance of beneficial farming conditions such as rural infrastructure, including roads and irrigation systems, as well as regulatory frameworks that stimulate market growth and protect supply chains, including: national and international trade and commerce networks, taxation and FDI incentives, and production and trade diversification policies (Laitha, 2020; LIFT, 2017; Oxford Business Group, 2018a, 2018b; Phyo, 2021b). Importantly, such conditions are themselves structural manifestations of a market liberalization paradigm - a paradigm that presents a potential challenge to the role of the government in meeting national food security and food sovereignty needs - implying that *Government Support* extends to the discourse on and structural implications of its mandate to protect public interests (Bragdon, 2016). In other words, an international trade-focused food system that incentivizes the export of nutrient-dense produce such as pulses may reduce food system resilience by constraining food sovereignty and food equality for local populations.

The expansive nature of the types of government support indicates that all government ministries are involved in its provision, often in collaboration, but most directly through the Ministry of Agriculture, Livestock, and Irrigation (MOALI). MOALI is mandated to support broad-based agricultural development across Myanmar, though in practice is almost exclusively weighted towards rice farming, thereby stretching thin support for pulse farming in an already limited financial budget, for which it must jostle annually with other ministries (LIFT, 2017; Oxford Business Group, 2017, 2018a, 2018b; Phyo, 2021b). Various pulse sector stakeholders confirm that while the quantity and quality of support services and conditions therefore suffers in consistency and reliability, particularly in the implementation and enforcement of (food security) policies, such support is nevertheless a critical factor for the advancement of the pulse farming industry (Laitha, 2020; Lwin, 2021; Nyunt, 2020; Oxford Business Group, 2018b, 2020a; Sandar, 2021; Shwe, 2020; Thu, 2021).



Influence

Dynamics

The current direct influence of this leverage point on system dynamics.

When leveraging *Government Support*, the extent and role of government assistance for pulse farming is predominantly influenced, as represented by the **Government support** variable in the system map. This variable has a number of direct connections and interconnections with other variables, indicating the immediate systemic influence of this leverage point.

Willingness to join associations – Farmer cooperatives are burdened by stigmas stemming from the disastrous socialist policies of former military governments who co-opted associations as vehicles of social control that ultimately decimated agricultural production and consigned rural families to decades of poverty (Ferguson, 2013; Okamoto, 2008; Stifel, 1972). There is therefore significant hesitance amongst pulse farmers to join modern-day associations whose collective bargaining power and aggregated resources deliver significant benefits to members (Ferguson, 2013; Nyunt, 2020). Interestingly, leading associations indicate that an increase in government resource support for such collectives, separate from the more politically-controlled cooperatives under the Ministry of Cooperatives, leads to a higher interest in association membership from pulse farmers, due to the increased tangibility of membership benefits as well as palpable resource disparities between members and non-members (FAO & LIFT, 2016; Nyunt, 2020; Shwe, 2020). Increasing government regulatory support would therefore remove perceived barriers to association membership and offer more flexible ways for farmers to form collectives by evidencing the benefits for pulse farmers.

Accessibility of financial support options & **Availability of timely loans** – According to pulse farmers, there are limited financial support options available to them, the majority of which are structured around public financial institutions and brokers (Aung, 2021; Oo, 2021). Compounded by their bureaucratic and constrained loan application processes that also do not align with critical farming milestones, farmers often turn to informal financing alternatives that provide them with immediate cash-in-hand but at exorbitant interest rates (Oxford Business Group, 2017, 2020a; Phyo, 2021a; Phyu, 2020). Increasing government support in rural areas to enhance the conditions necessary for lenders to expand rurally and/or new lenders to enter agricultural financing would help alleviate accessibility and availability issues (Oxford Business Group, 2017).

Farmer knowledge of sustainable agriculture & **Availability of suitable pulse farming technology** – Traditional farming practices have been passed down from generation to generation ever since farming in the Delta region began thousands of years ago (McIntosh, 2018; Thant Myint, 2006). Such practices have necessarily adjusted over time to accommodate new crops as well as changes in socio-economic climates (Okamoto, 2008; SeinnSeinn et al., 2015). Nevertheless, the accelerated impact of climate change in the region is misaligned with these reactive and incremental farming adjustments and requires more radical and proactive farming innovations towards sustainable agriculture practices (SeinnSeinn et al., 2015; van Driel & Nauta, 2013). Currently, however, such knowledge of sustainable agriculture is virtually nonexistent, with only a handful of NGO-led and government-led programs active in the region (Lwin, 2021; Oxford Business Group, 2018c, 2020b; Phyo, 2021b). Moreover, farmers in the Delta region have not quickly transitioned from animal and human-powered cultivation and harvesting to mechanized agriculture, despite significant reductions in labor availability and increases in labor costs (Laitha, 2020; Oxford Business Group, 2018a, 2018b). This is because effective modern farming technologies are not economically viable for individual farmers, have peak demand cycles that are untenable, and are often not suitable for either multi-cropping purposes or Delta-region ecological conditions (Khaing, 2021; Laitha, 2020; Oxford Business Group, 2018b; Sandar, 2021; SeinnSeinn et al., 2015). Given the economic importance of the Delta region for Myanmar, as well as the interdependencies between agriculture, technology, and ecology, there is ample urgency and opportunity for increased government support in promoting sustainable agriculture initiatives and suitable modern technologies in pulse farming.

Prohibiting

- **Government Sector (Non-Agriculture Ministries)**
  Are incentivized to maximize their budgets in a rigorous, zero-sum annual budgeting process, thereby reducing government support for pulse farming.

Neutral

- **Smallholder Farmers**
  Are incentivized to demand government support but are wary of historical precedence.
- **Government Sector (Agriculture Ministries)**
  Are incentivized to facilitate all agricultural farmers within annual budget constraints, thereby de-prioritizing sector-specific support needs.
- **General Public**
  Are incentivized through voting and taxes to hold the government accountable for balancing national economic policies, thereby shifting the prioritization of key sectors in accordance with the socio-political climate.

Supporting

- **Farmer Associations**
  Are incentivized to pressure the government for more resources to attract new members and reward existing members.
- **Financial Institutions (Public & Private)**
  Are incentivized to expand market opportunities and to meet farmer funding needs, thereby lobbying for favorable government support policies.
- **NGOs**
  Are incentivized to meet mission objectives, often mandated in collaboration with local government entities, thereby enlisting government support in the pulse sector.
- **Input Suppliers (Farming Technologies)**
  Are incentivized to generate profits by maximizing sales and demonstrating product efficacy, thereby seeking government support in expanding favorable market conditions.
- **Input Suppliers (Farming Knowledge)**
  Are incentivized to disseminate modern and sustainable farming approaches and best practices, thereby lobbying for favorable government support policies.
- **Exporters**
  Are incentivized to extend (export) industry growth and value, thereby pursuing government support for pulse farming.

Stakeholders

Current forces that help or support and counterforces that prohibit or hinder healthy system behavior as exerted by stakeholders on this leverage point.

Effectiveness

The current transformative capacity of this leverage point on system behavior.

Influencing the amount of resources such as money or knowledge that are committed by government entities to pulse farming might on the surface seem like a shallow point of leverage as it focuses on the size and structure of material stocks and flows. However, when it comes to the government specifically, even changes to mechanistic characteristics of the system can have significant design and intent implications and therefore render the point of leverage as deep.

This is because the government literally establishes the rules of the system - the agricultural rules and regulations across the country - and is therefore the single most powerful stakeholder in any socio-economic system. Decisions made at this level have the ability to influence the system's capacity for self-organization, the structure of information flows, the goals of the system, and even the mindset and values underpinning the system.

This type of deep change is especially likely when the government reevaluates its fiduciary role in supporting the agricultural sector, for example towards achieving social goals such as food and nutrition security as well as climate resilience and environmental regeneration. Such repositioning would prioritize a more diverse and rights-based approach that accounts for planetary boundaries and may reclaim a space where market forces currently play too influential a role (and that accumulates risk and debt responsibilities with smallholder pulse farmers). Paradigm shifts such as these would influence the underlying conditions necessary for climate-resilient pulse farming rather than the material stocks and flows required for pulse farming. The effectiveness of *Government Support* as a leverage point is therefore high relative to shallower leverage points. (Abson et al., 2017; Bragdon, 2016; Fischer & Riechers, 2019; Meadows, 1997; Rockström et al., 2009)

Intervention opportunities

The current intervention opportunities for transformative change at this leverage point.

To facilitate support from the government, various intervention opportunities exist that run the gamut of leverage point effectiveness: from increasing the amount of committed resources for pulse farming, through altering the conditions and rules necessary for climate-resilient farming systems, to changing the system goals and underlying mindsets of food production as well as reorienting the paradigms that inform the role of government in food systems.

Given the range of different system stakeholders that are incentivized to assist initiatives that increase government support, there is significant enabling momentum for interventions that at the very least increase conditions and resources in support of pulse farming. On a very basic level, additional pulse farming funding could be made conditional on outcomes such as sustainable agriculture-training completion rates or could aim to decrease government-dependency in the sector by facilitating multi-stakeholder collaborations linked to climate-sensitive targets. The national Agriculture Development Strategy and Investment Plan (ADS), for example, was drafted in 2018 with the help of the Asian Development Bank, the UN Food and Agriculture Organisation, and the Livelihood and Food Security Trust Fund, with the aim of accelerating agricultural growth by increasing cross-sector cooperation and promoting good agricultural practices and strengthening support services (Oxford Business Group, 2018b, 2018c). If linked to environmental sustainability objectives, such government-led initiatives can lead to deep changes in food system structures and provide ecological safeguards. For example, the National Environmental Policy and the Myanmar Climate Change Policy, two policies introduced by the government in 2019, are long-term policies that recognize climate change complications and aim to promote socially and environmentally inclusive agricultural measures (Oxford Business Group, 2020a).

The government itself could therefore make adjustments to financial systems and regulatory frameworks that would alter system design structures and apply to all stakeholders. Current prohibiting stakeholder forces might even be reassured if system rules are addressed in ways that emphasize cross-ministry collaboration such that annual budgetary allocations become more mutually reinforcing. By recognizing interdependencies between food production and socio-economic wellbeing, for example, the Ministry of Health and Sports, Ministry of Commerce (MOC), and Ministry of Education might see collaboration benefits for their own mandated objectives in allocating funding towards climate-resilient pulse farming. In any case, current opportunities for truly transformative change at this leverage point lie in potential shifts in food systems goals and mindsets in which stakeholder values and beliefs of pulse farming change. Such intervention opportunities at this point of leverage in the system would involve shifting current paradigms underpinning food and agriculture systems from 'food as (economic) growth' towards 'food as resilience' (Foodtank, 2021).

Opportunities for intervention at this point of leverage might involve the following approaches:

Establishing an integrated food policy
Recognizing food as interconnected systems that are also relevant to domains such as health, environment, and education allows for approaches that join up currently-siloed goals and policies related to food systems vertically and horizontally between government levels and between public, private, and nonprofit sectors. Such an approach recognizes the outsized influence of public policy in the maintenance of underlying food system structures and encourages the coordination and alignment of efforts in order to reduce incoherences and tackle food system challenges more effectively. By integrating policy domains, policy levels, and supply chain stakeholders around a climate-resilient food system goal, for example, a national integrated food policy could lead to the emergence of new system structures supporting a food system paradigm of 'food as resilience'. See for example: Candel & Pereira (2017); Centre for Food Policy (n.d.).

Incorporating agroecological approaches into the ADS
Agroecology is the application of ecological concepts and principals in farming and is increasingly used as a resilience strategy to maintain the natural resource base of agricultural production in order to ensure long-term economic viability and mitigate climate change. Empirical studies indicate that long-term sustainability benefits can result from agroecological measures such as agriculture diversification in the form of polycultures, agroforestry systems, and crop-livestock or crop-wildlife mixed systems - conditional on the integration of local communities into agroecological strategies. Incorporating regulatory incentives into public policy such as the ADS that remunerates investments in the long-term ecological resilience of farming systems can therefore bring about transformative change away from intensive conventional food production towards food systems with reduced vulnerability to climate variability. See for example: Altieri et al. (2015); Biovision (2021); Gliessman (2016); Leippert et al. (2020); Poux & Aubert (2018).

Facilitating circular landscape systems
Closed-loop agricultural practices form part of circular landscape systems in which nutrients, water, and organic matter material are recycled (a closed loop), counter to open-loop conventional industrial agricultural practices that depend on external inputs and from which waste products are disposed (an open loop). Governments can experiment with circular landscape systems in public-private partnerships and provide policy incentives and regulation to stimulate closed-loop agri-clusters in regional landscapes. Such efforts have the potential not only to reduce or eliminate harmful external inputs such as chemical contaminants, but also to establish self-sustaining agroecological systems such as smallholder integrated farms that are self-organizing and resilient to climate shocks. See for example: HNS Landscape Architects (n.d.); Li et al. (2020); Putra & Yuliando (2015); Tan et al. (2010).

Unintended Consequences

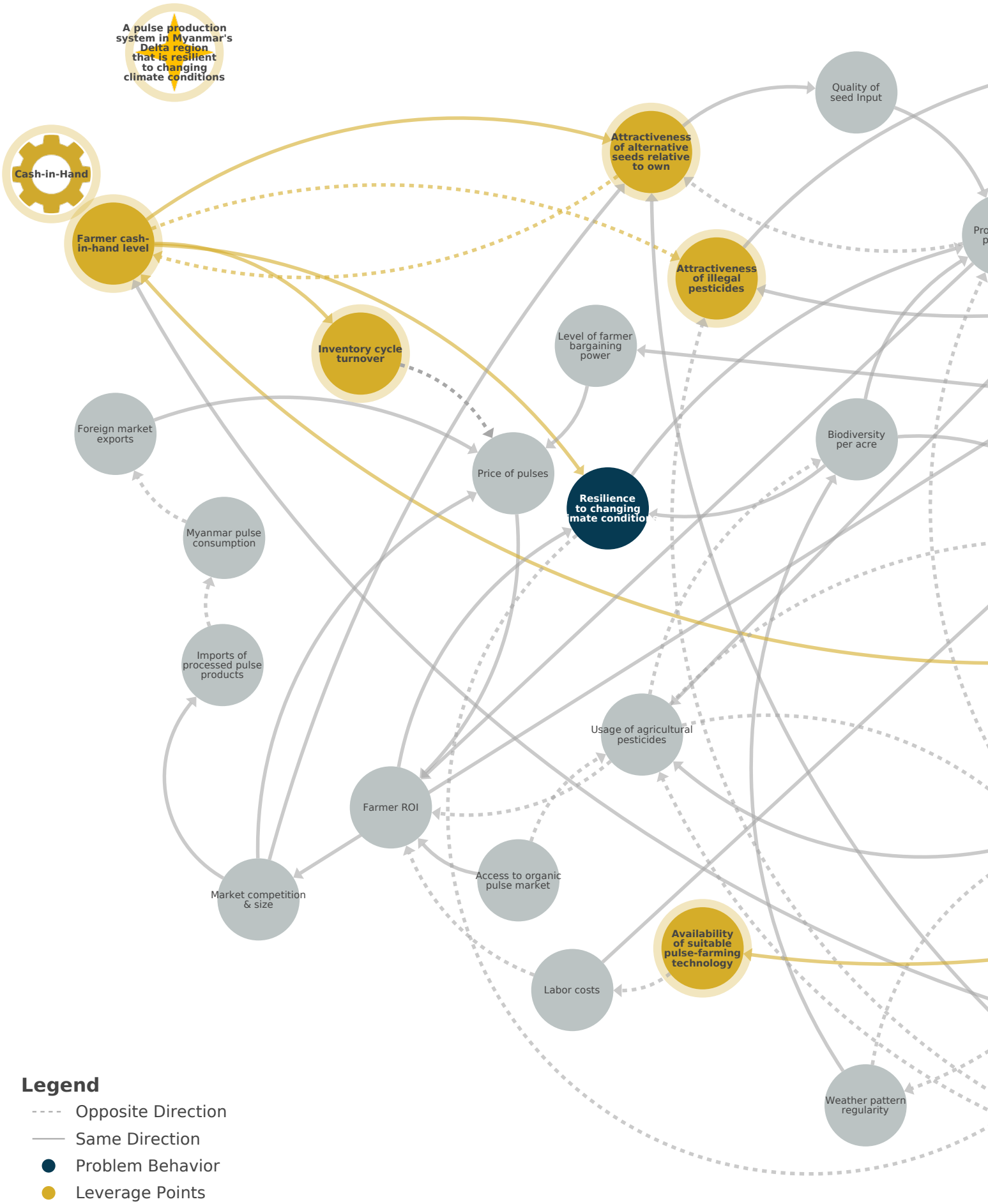
The potential unintended systemic effects of interventions at this leverage point.

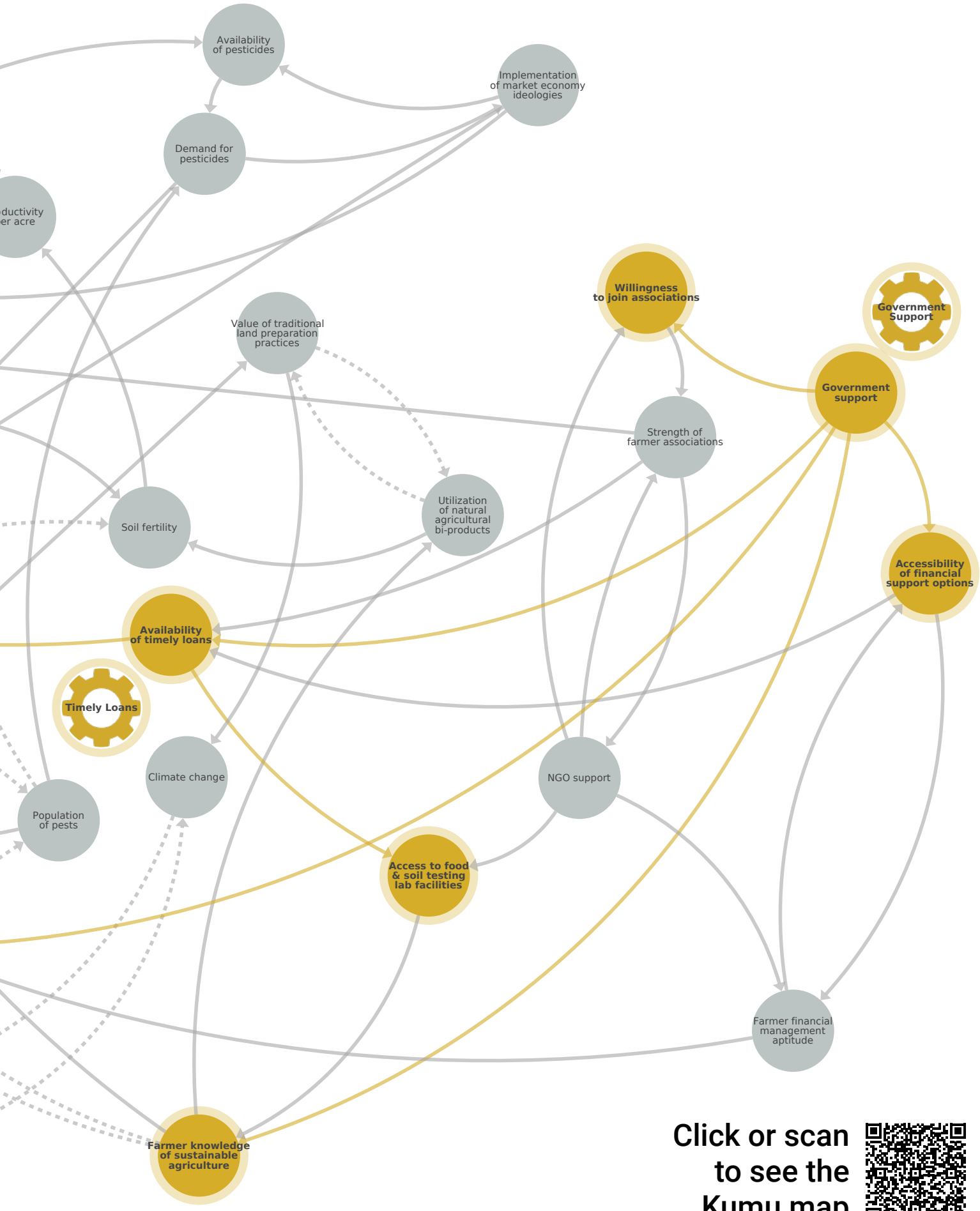
Increasing the government support for pulse farming will lead to multiple unintended systemic effects, some of which may damage the system elsewhere or even counteract the intended problem-free future state of the system.
When designing interventions, stakeholders seeking to intervene at this point of leverage should consider these potential effects in order to mitigate them.
These unintended consequences could include:

Revenue diversion
As agricultural ministries commit more resources and enhance conditions amenable to pulse farming, their additional tax revenue requirements and diversions to other vital parts of the economy such as education, health, and social development might influence taxpayers' willingness to pay. See for example: Morrison & MacDonald (2011); Swallow & McGonagle (2006).

Institutional Failure
Initiatives such as cross-sector collaboration aimed at reducing government-dependency in pulse agriculture may endanger existing institutional structures which, if not managed, could lead to loss of important institutional elements and short-term economic penalties. See for example: Abson et al. (2017); Bauer & Knill (2014); Newig (2013).

Market Disruption
When addressing the underlying mindset and goals of food systems, existing pulse farming structures that are focused on efficiency and optimization including commerce and trade networks are likely to experience disruptions as farming communities and supply chains adopt new methods and implement new regulatory policies. See for example: Phadnis & Joglekar (2020); Sheffi & Rice (2005); Stecke & Kumar (2009).


A pulse production system in Myanmar's Delta region that is resilient to changing climate conditions
Cash-in-Hand
Farmer cash-in-hand level
Attractiveness of alternative seeds relative to own
Quality of seed Input
Attractiveness of illegal pesticides
Inventory cycle turnover
Level of farmer bargaining power
Foreign market exports
Price of pulses
Resilience to changing mate conditio
Biodiversity per acre
Myanmar pulse consumption
Imports of processed pulse products
Usage of agricultural pesticides
Farmer ROI
Access to organic pulse market
Market competition & size
Availability of suitable pulse-farming technology
Labor costs
Weather pattern regularity
Legend
Opposite Direction
Same Direction
Problem Behavior
Leverage Points



Click or scan to see the Kumu map

Chapter 04:

CHANGE STRATEGIES

Few leverage points singularly have the capacity to overcome existing counteracting forces in the system that are working to maintain the status quo (Abson et al., 2017). Moreover, leverage points are not independent but rather interdependent, collectively influencing and reinforcing each other and leading to emergent system behavior (Fischer & Riechers, 2019). To realize transformational change therefore, a portfolio approach must be adopted by stakeholder collectives in which decision-makers recognize the interdependencies between leverage points and formulate strategies or pathways to systems change. Such an approach should consider the following two aspects: (1) the combinations of leverage points that could generate systems change, and (2) the subsequent combinations of stakeholders that could collectively intervene at those leverage points. (Murphy & Jones, 2020; Stroh, 2015)

Systemic Theory of Change

To generate healthier emergent system behavior, systems practitioners aim to have a collective systems change strategy that describes how one type of intervention or change in a system, from one leverage point, precipitates another change at another leverage point. These chains of leverage can be formulated into narratives of systems change called Systemic Theories of Change (STOC), that trace how change may unfold in a given system (Murphy & Jones, 2020). Selecting a sequence or order of intervention is not based on the prioritization of one leverage point over another, but is based on the ways in which leverage points reinforce each other and learn from each other over time so that they can most effectively lead to new emergent behavior. There are likely many options, but one interdependence that can isolate more effective chains of leverage is based on the depth of the identified leverage points. Relatively shallow interventions may pave the way for deeper changes, while at other times, deeper changes may be required for shallow interventions to work. Generally, a chain of leverage that only involves shallow leverage points is unlikely to effect transformation, whereas a chain that extends to deep leverage points has the potential to bring about transformative change. (Abson et al., 2017; Fischer & Riechers, 2019)

The pulse food system map on pages 28-29 provides a visual representation of a chain of leverage based on the system dynamics leading to the current problem behavior. This is mirrored in the STOC depicted in Figure 4.1 which illustrates a configuration of the leverage points in a chain of leverage that capitalizes on their interconnections in a way that would reinforce their influence on system behavior. As shown, the chain of leverage traces the system dynamic influence from *Government Support*, through *Timely Loans*, to *Cash-in-Hand* which ultimately directly influences the problem behavior variable: **Resilience to changing climate conditions**. In particular, the figure visualizes the direct, indirect, and peripheral relationships between these variables - often in the form of feedback loops - and the circular nature of the complex problem, indicating how the interdependencies of these points of leverage could ultimately lead to changes in pulse-system climate resilience. In this way, interventions at **Government support** reinforce interventions at the **Availability of timely loans** which in turn reinforce interventions at **Farmer cash-in-hand level**. There is therefore potential for transformational systems change towards climate-resilient pulse farming if stakeholders influence these three points of leverage through reinforcing interventions.

However, it is the particular combination of the types of interventions, and specifically the depth of their leverage, that lead to various narratives of change. These STOCs are outlined here and can be seen as change strategies for nudging the pulse production system towards emergent climate-resilient behavior. The strategies reflect the variation in depth of potential interventions at each leverage point as well as their respective transformative capacity. Specifically for climate-resilience, bearing in mind that there is no definite categorical differentiation of depth, the strategies imply that shallower interventions are easier to implement and likely to build the self-organizing capacity of pulse farmers, while deeper interventions are more difficult to implement but also more likely to build the self-organizing capacity of various pulse stakeholders and the pulse production system as a whole.

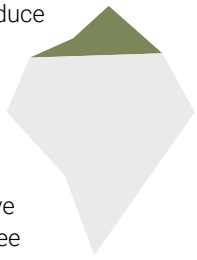
Point of Note: Missing Chain

The disruptions caused by the illegal seizure of power by the Tatmadaw on February 1st, 2021 directly impeded the continuation and completion of this research partnership, to the extent that only a small portion of the findings could be presented in this report. Only **one out of two** identified chains of leverage, for example, are outlined in this chapter. The remaining chain of leverage traces the system dynamic influence from *Environmental Sustainability Knowledge* and *Labor Shortage* through *Utilization of Natural Products*, to *Maintenance of Biodiversity*, which ultimately directly influences the problem behavior variable: **Resilience to changing climate conditions**.
The system dynamic influence of this chain of leverage can be retraced in this Kumu systems map under *Map 6: Leverage Point Influence* by selecting: LP4, LP5, LP9, and LP10.

Strategy 1: Build Pulse Farmer Resilience

The first strategy, or STOC, focuses on the mechanistic characteristics of the system at the identified leverage points. Interventions here influence the size of stocks and flows and work to reduce delays in the system that are currently limiting farmer agency and self-organizing capacity. Specifically, the interventions reinforce each other at the three leverage points to ultimately increase the amount of resources available to pulse farmers to adapt to climate shocks.

In this approach, interventions leveraging *Government Support* aim to increase the amount of committed resources for pulse farming from government entities, including the improvement of conditions necessary for timelier loan disbursement. This would facilitate interventions leveraging *Timely Loans* that aim to reduce the current delays in lending processes, particularly those that limit farmer cash-in-hand levels during key pulse farming activity milestones. In turn, this would supplement alternative interventions leveraging *Cash-in-Hand* that also aim to directly increase cash inflows to pulse farmers. The collective configuration of the interventions below at these three leverage points reinforce each other as shown in Figure 4.1, despite their relatively shallow effectiveness, and ultimately build pulse farmer resilience by improving their capacity to adapt to and absorb climatic shocks.



Commit more resources and improve conditions for pulse farming

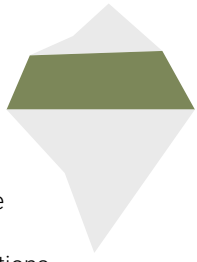
Reduce delays in lending processes during key pulse farming activity milestones

Directly increase cash inflows to pulse farmers

Strategy 2: Build Pulse Stakeholder Resilience

The second strategy, or STOC, focuses on both the mechanistic characteristics as well as the internal dynamics of the system at the identified leverage points. Interventions here influence material stocks and flows as well as design structures of the system that are currently limiting stakeholder agency and self-organizing capacity. Specifically, the interventions reinforce each other at the three leverage points to ultimately improve the conditions for various pulse stakeholders to adapt to climate shocks.

In this approach, interventions leveraging *Government Support* aim to decrease government dependency in the sector, including the improvement of conditions for multi-stakeholder collaborations in key resource infrastructures such as farming inputs and agri-finance. This would facilitate interventions leveraging *Timely Loans* that aim to reduce loan-dependency, particularly those that disrupt current system structures by providing timely alternative methods of meeting pulse farming resource requirements. In turn, this would supplement interventions leveraging *Cash-in-Hand* that aim to decrease cash outflows from pulse farmers by accelerating their financial management aptitude. The collective configuration of the interventions below at these three leverage points reinforce each other as shown in Figure 4.1, given their combination of shallow and deep effectiveness, and ultimately build pulse stakeholder resilience by improving their capacity to adapt to and absorb climatic shocks.



Incentivize multi-stakeholder alternatives that decrease government-dependency

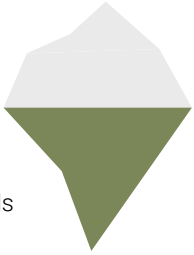
Incentivize resource alternatives that reduce loan-dependency

Develop farmer financial management aptitude to decrease cash outflows

Strategy 3: Build Pulse System Resilience

The third strategy, or STOC, focuses on the values embodied by the system at the identified leverage points and the resulting system structures that emerge. Interventions here influence the paradigms, goals, and mindsets that are currently limiting the system's self-organizing capacity. Specifically, the interventions reinforce each other at the three leverage points to ultimately improve the ability of the pulse system to adapt to climate shocks.

In this approach, interventions leveraging *Government Support* aim to change the current paradigms underpinning pulse farming, including a mindset shift from 'food as (economic) growth' to 'food as resilience'. This would facilitate interventions leveraging *Timely Loans* that aim to restructure key resource infrastructures such as agri-finance along climate-resilience requirements, particularly those that account for interdependencies between agriculture and environmental sustainability. In turn, this would supplement interventions leveraging *Cash-in-Hand* that aim to develop farmer capacity to assess and balance short-term and long-term financial needs in alignment with environmental changes and farm regeneration requirements. The collective configuration of the interventions below at these three leverage points reinforce each other as shown in Figure 4.1, considering their relatively deep effectiveness, and ultimately build pulse system resilience by improving its capacity to adapt to and absorb climatic shocks.



Shift government paradigm to 'food as resilience'

Restructure agri-finance along climate-resilience requirements

Balance farming expenditures with environmental regeneration

STOC Guidance

This STOC diagram illustrates how change may unfold in the pulse production system when applying the strategy-specific interventions. Crucially, the STOC emphasizes the circular nature of the system, showing multiple feedback loops and interdependencies between the variables. This underscores the reinforcing nature of the leverage points and, consequently, that a sequence of interventions can originate at any point of leverage.

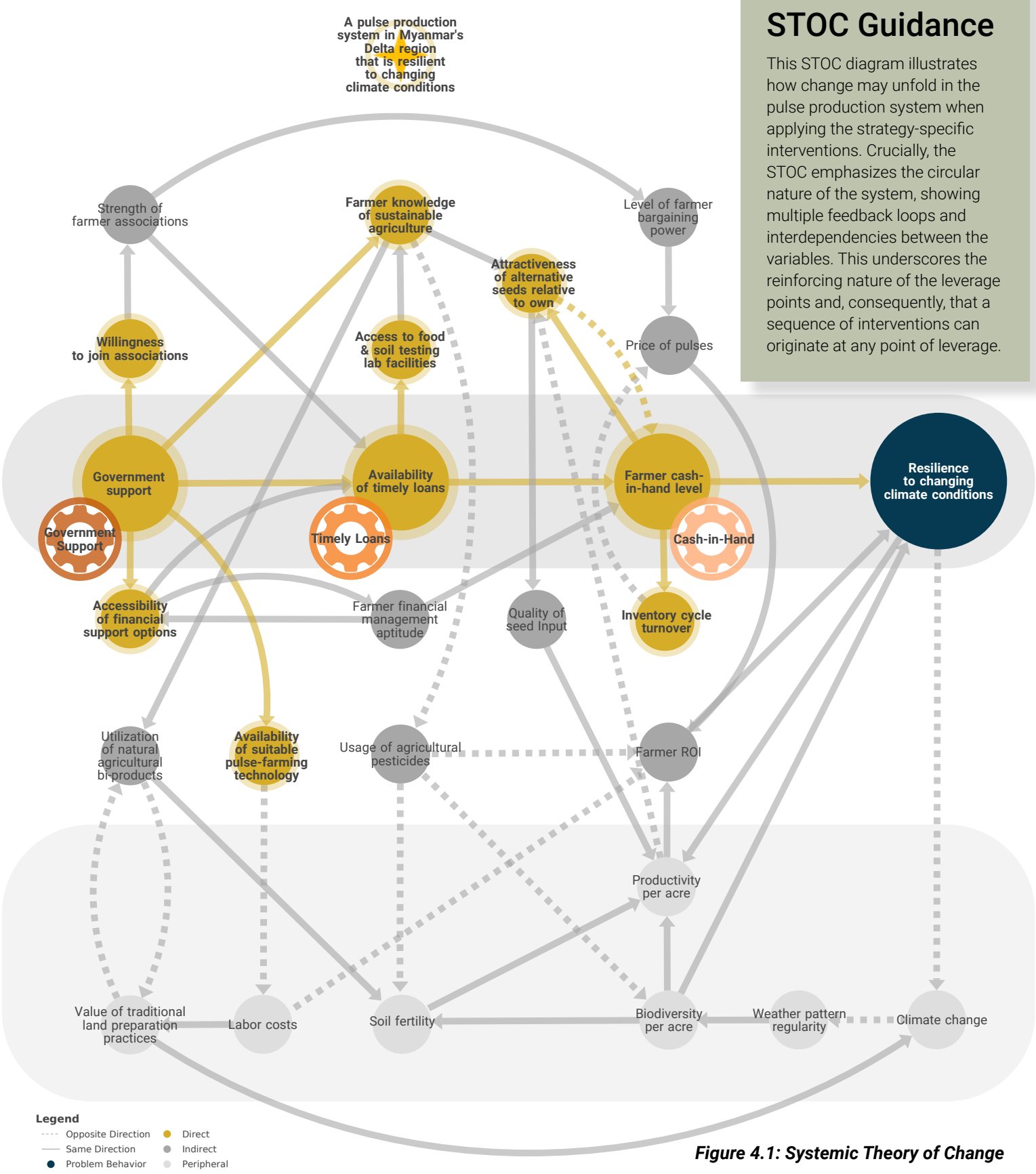


Figure 4.1: Systemic Theory of Change

Point of Discussion: Shifting Mindsets

The common mindsight underpinning strategy formation is linear: based on ex-ante prioritizations and sequences of actions. Systems, however, are made of interdependent variables, feedback loops, and iterative interactions. Systems change strategies are therefore based on a fundamentally different mindset of non-linearity. This effectively implies that strategies for systems change must maintain a flexible nature that allows for experimentation and learning. Such an approach conflicts with the modus operandi of most impact organizations who maintain project-based initiatives, short-term horizons, and ex-ante measurable impact requirements. Changing this mindset is the first step to changing systems. (Seelos et al., 2021)

Coalitions for Change

A coalition is a temporary alliance or partnership formed with the aim of achieving a defined goal or outcome. To achieve transformational systems change, coalitions of multiple different stakeholders in the system are required (Ashoka, 2020; Wolfensohn, 1999). By synthesizing stakeholder actions behind a unifying vision, resources can be pooled to overcome resistance and intervene at multiple leverage points in the system. Therefore, the most effective systems change occurs through so-called Coalitions for Change in which multiple stakeholders work together in a type of portfolio approach to nudge systems towards a shared vision of healthy system behavior. The appeal of such coalitions is most significant for stakeholders who are individually grappling with similar or related complex issues and whose economic or organizational activities and influence align with the leverage point topic areas (Brouwer et al., 2016). As such, identified chains of leverage can provide a blueprint for the types of coalition stakeholders required for systems change.

In the pulse production system, different stakeholders aimed at nudging the pulse production system towards climate-resilient behavior are likely to intervene independently in the system at the various identified points of leverage. When synthesized, coordinated efforts at these points of leverage are more likely to facilitate transformational systems change. Figure 4.2 depicts a configuration of the potential coalition stakeholders for the chain of leverage encompassing *Government Support*, *Timely Loans*, and *Cash-in-Hand* (see *Map 7: Coalition Stakeholders* in this Kumu systems map for a complete overview). It groups stakeholders based on their aggregate incentives across the leverage points to assist or hinder systems interventions. Specifically, smallholder farmers, both public and private financial institutions, and agriculture ministries represent supporting forces currently motivated to assist interventions at these points of leverage, while non-agriculture ministries represent the greatest prohibiting counterforce to such interventions. Exporters and input suppliers oscillate between the two depending on the type of intervention and at which leverage point in the system. Finally, a few different stakeholders are likely to support interventions at individual leverage points, though not necessarily across the entire chain of leverage, including: farmer associations, NGOs, and the general public.

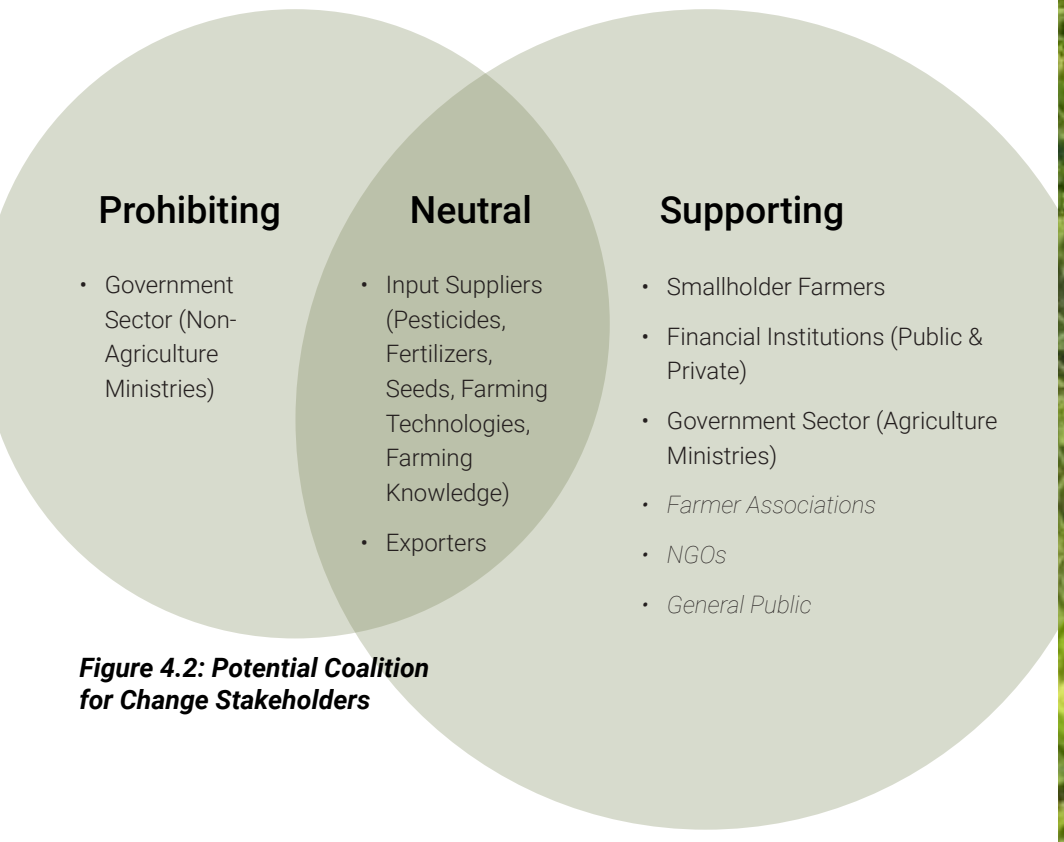


Figure 4.2: Potential Coalition for Change Stakeholders

These stakeholder types are represented across all three strategies for this chain of leverage. Nevertheless, the extent of stakeholder coalition participation may also fluctuate depending on the depth of intervention at each leverage point. In this way, the particular strategy adopted by the coalition would influence how much transformational momentum the coalition would have. Both strategy adoption and stakeholder participation are therefore based on the depth of interventions. In theory, higher effectiveness correlates positively with greater depth, yet in practice there may be more observable nuances. This is because strategies that involve relatively shallow interventions, like Strategy 1, are much easier to implement and are simpler to measure in terms of outputs, and therefore gain traction and credibility more quickly than strategies with relatively deeper interventions, like Strategy 2 and Strategy 3, which are harder to implement, are more difficult to measure in terms of outcomes, and therefore take longer to gain traction and credibility. Specifically, there is currently significant enabling momentum for Strategy 1 that aims to increase conditions and resources in support of pulse farming, including reductions in credit flow delays, while Strategy 2 and Strategy 3 are likely to face significant resistance as they require the restructuring of vital resource infrastructures and policies as well as shifts in deeply-ingrained mindsets and values.

Strategy selection therefore has numerous trade-off implications for coalition formation including membership criteria such as: duration, size, resources, and credibility. This effectively implies that both the strategy for systems change as well as coalition membership must maintain a flexible nature that allows for experimentation and learning. Coalition partners should be mindful of these implications not only when determining the appropriate combination of coalition stakeholders at any given time but also when selecting and adjusting a strategic approach to collective intervention. Importantly, whether building farmer, stakeholder, or system resilience to changing climate conditions, the pulse production system Coalition for Change should be built around a shared vision and made up of members that are grappling with similar or related complex issues whose interventions have inherent reinforcing and synergistic potential to deliver transformative systems change.

Point of Discussion: Coalition Formation

There is some nuance to the selection or invitation of members for Coalitions for Change. This is because in reality, not all stakeholders may be equally approachable, willing, or able to join such an alliance. Also, some stakeholder types may not have adequate representation either because they are too dispersed or fractioned (eg: government, farmers, etc), or their interests cannot be unified or personified (eg: society, nature, etc). In addition, the size of the coalition influences its effectiveness where too few or too many members could severely limit its decision-making and coordination abilities. Coalition formation will therefore depend on local circumstances, existing power structures and networks, time and resources available, and a host of other criteria that should be carefully considered.
A common approach is to introduce policies that enable coalition flexibility, for example in such a way that members can voluntarily join and leave coalition efforts depending on the systems change requirements at the time (OECD, 2006). This ensures that coalitions for change remain representative of the system.

Point of Discussion: Coalition Activities

Coalitions for Change can take time to establish, but once formed, have the collective strength to nudge the system through interventions. Identifying intervention opportunities at each leverage point, therefore, is the next step of the systems change process. In this step, members identify existing interventions and brainstorm new interventions, ultimately weighing their implementation requirements and alignment with strategy objectives. A coherent portfolio approach is then formed consisting of a selection of reinforcing interventions. Next, members select impact metrics at each point of leverage, establish benchmark measurements, and monitor changes. Importantly, a coalition's effectiveness depends on its ability to learn and adjust to changes in the system, such as unintended consequences of interventions. This necessitates a continual process of experimentation as well as iteratively mapping the system so that it continues to reflect a shared view of reality. When done right, Coalitions for Change can realize and scale surprisingly non-intuitive approaches that help develop healthy emergent system behavior. See for example: Ashoka (2020); Catalyst 2030 (n.d.); Theisohn & Hidalga (2013).

Reflections on a Pulse Food System Coalition for Change

To realize a pulse production system in Myanmar's Delta region that is resilient to changing climate conditions, we can back-cast an approach and form a Coalition for Change based on the identified chains of leverage in this project report. In other words, first sharing an end goal and then an understanding of the structural interdependencies of the current pulse production system allows us to work backwards and use various chains of leverage as roadmaps to realizing systems change. These chains provide useful indications as to the types of stakeholders that should be involved in the coalition and the strategies they could collectively adopt.

I would like to take the opportunity here to deliberate on a potential pulse food system Coalition for Change based on the findings from this research project, to illustrate how the insights from this report specifically – and a systems approach to complex problems generally – can be useful to practitioners in setting actionable objectives and strategies for meaningful change. The outlined potential coalition partners and potential coalition strategy is of course in no way comprehensive and is merely a suggestive exercise. I firmly believe that multi-stakeholder coalitions that adopt systems mindsets and approaches have the greatest potential for realizing transformational systems change.

Bram Peters
Programme Officer Inclusion and Innovation
ICCO Cooperation

Potential Coalition Partners

Smallholder Farmers & Farmer Associations

Organized and represented by farmer development associations and cooperatives.

While individually farmers may not be able to exert much influence, together they represent a significant group using a large amount of resources in the Ayeyarwady region. Given that Myanmar seeks to develop the Delta, farmers should be included at the forefront of development policy as both entrepreneurs and inhabitants.

Potential partners: *Yangon Farmer Development Association, Ayam Network, etc.*

Financial Institutions (Public & Private)

With an interest in improving farmer lending models and exploring value chain financing.

Banks that are willing to explore value chain financing beyond collateralized loans are key in setting up more tailored products that build farmer assets, link companies looking for quality or reliable sourcing, and meet the needs of all pulse supply chain stakeholders. It is therefore imperative to involve public and private financial institutions that seek to innovate products and services and improve outreach to farmers.

Potential partners: *A-Bank, Yoma Bank, MADB, etc.*

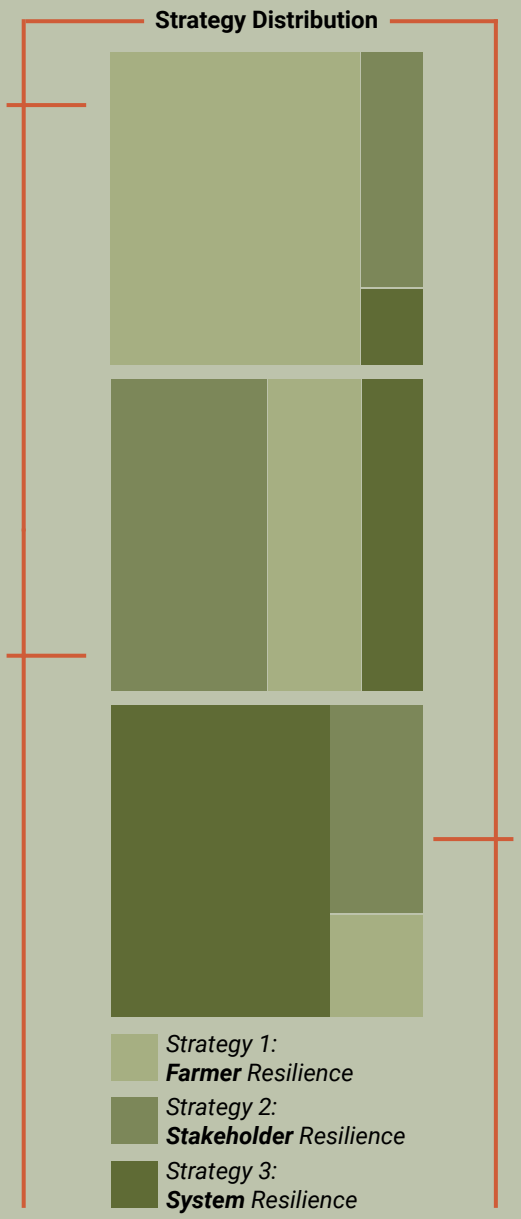
Potential Coalition Roadmap

Phase 1: Addressing Short-Term Needs

The initial core group of partners would seek to organize interventions that in the short-term improve farmer cash-in-hand levels by improving market linkages and quality improvement for pulse farmers, while also facilitating financial credit contracts with private sector partners to make loans timelier. Throughout these approaches, evidence-based data collection, policy briefs, and intensive lobbying activities would seek to mobilize government support for freeing up more resources for the pulse sector, while initiating the argument for seeing 'food as resilience'.

Phase 2: Changing Support Structures

Depending on momentum, the coalition should be expanded to accommodate new partners in this phase. Specialist fintech companies, agri-tech social enterprises, and financial literacy providers will be required to develop farmers' financial management capacity (e.g.: Greenovator). This would strengthen the effectiveness of - and reduce farmer dependency on - credit facilities. To further support lending and saving, the coalition can facilitate international cooperation with foreign banking partners (e.g.: Rabobank). While continuing the argument for seeing 'food as resilience', the coalition would focus on reducing government dependency in the sector by facilitating multi-stakeholder collaborations within the value chain.



Phase 3: Shifting Underlying Values

Further down the road, the focus of the coalition should shift to addressing the values embodied by the system at the identified leverage points. Here it becomes essential to build a 'food as resilience' community of practice that brings together leaders from the private sector (e.g.: Awba, East-West Seed, Armo, Myanmar Pulses Beans and Sesame Seeds Merchants Association), farming communities, environmental NGOs (e.g.: WWF), and various Ayeyarwady regional government ministries (e.g.: MOALI, MOC, Ministry of Natural Resources and Environmental Conservation, Ministry of Finance Planning and Industry). Bringing different ministries into the fold is particularly important to facilitate an exchange of disciplines. Discussions and strategies developed here would seek to both challenge and deepen the Myanmar government's long-term strategies - such as the Myanmar Economic Recovery and Reform Plan (MERRP) and the Myanmar Sustainable Development Plan (MSDP) – towards: the inclusion of environmental goals in food systems, strengthening stakeholders' self-organizing capacity, and prioritizing notions of food sovereignty and food security over trade-based globalization paradigms. Based on these discussions, the coalition would support translating priorities into actionable interventions along various chains of leverage in the pulse production system.

NGOs

A facilitating organization with local farmer expertise and match-making capabilities.

NGOs can play a flexible, facilitating role, are trusted more by farmers, and have extensive connections within the public and private sectors. They can offer capacity building services but also act as matchmakers between farmers and key companies. The fundamental weakness of these players is that they are dependent on donor funding.

Potential partners: *ICCO Cooperation, Network Activities Group (NAG), Mercy Corps, etc.*

Input Suppliers (Farming Knowledge)

A (policy) research organization with extensive knowledge and experience in agricultural theory and practice.

Organizations capable of analyzing data, facilitating learning, and sharing evidence-based recommendations with policymakers are important contributors because they are perceived as relatively unbiased by other stakeholders and can use international networks to gain access to key decision makers. Essential here is the link between short-term results, external factor analysis, and long-term projections to ensure sustainability is constantly being monitored.

Potential partners: *Food and Agriculture Organisation (FAO), International Rice Research Institute (IRRI), International Food Policy Research Institute (IFPRI), Wageningen University, etc.*

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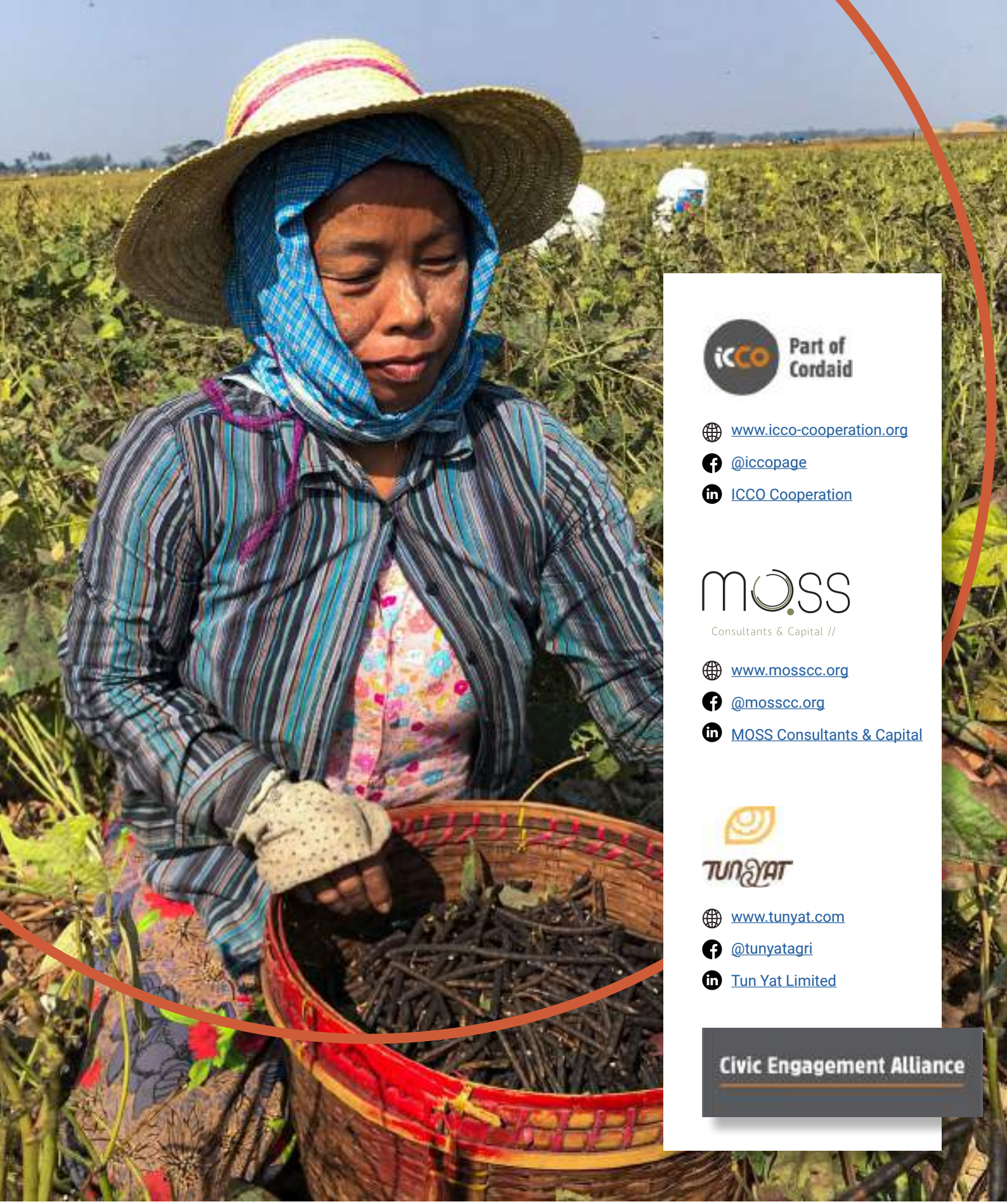

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Civic Engagement Alliance

Mapping the Myanmar Pulse Production System in Kumu

This research project applied a systems thinking approach to the pulse food production system in Myanmar's Delta region over a six-month period, culminating in a causal-loop-diagram (CLD) on which advanced systems analyses were conducted to identify high points of leverage. **The project CLD with the results of the analyses can be viewed online at Kumu using the QR code.** Contact MOSS for more information on the systems mapping and analysis process.