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Can agricultural intensification help attain sustainable development goals? Evidence from Africa and Asia

Neil Dawson, Adrian Martin and Laura Camfield 

School of International Development, University of East Anglia, Norwich, Norfolk, UK

ABSTRACT

Market-oriented agricultural intensification is a major development strategy, yet its alignment with sustainable development goals (SDGs) is unclear. We apply indicators for SDG 2 (eradicate hunger) regarding income, food production, food security and land tenure to recent intensifications in Rwanda and Laos to reveal their disaggregated impacts. We find while market-oriented intensification may generate poverty reduction, it also exacerbated marginalisation and poverty through various forms of land tenure insecurity. Ethnicity and gender were influential factors in Rwanda, and post-conflict resettlement policies in Laos. We discuss implications for development practice and selection of suitable indicators to reflect the ambition of the SDGs.

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Introduction: agricultural intensification as strategy for achievement of sustainable development goals

Due to the vast numbers of the world's poorest involved in farming, agricultural development policies play a major role in the achievement of poverty reduction globally.¹ The intensification of agricultural production has been, and continues to be, one of the most common policy strategies for promoting human development and improving food security.² Intensification efforts frequently focus on promotion of modern inputs such as seeds or fertilisers, commonly subsidised, to promote production of different crops, often with reduced fallow periods, geared towards national markets and international export. Market-oriented intensification is also supported through a 'land sparing' narrative, that increased production on currently-utilised land and may reduce pressure to convert forests, wetlands and other habitats to agriculture.³ Market-oriented intensification is envisaged to help smallholders sell cash crops to increase incomes, move away from subsistence farming, buy more food, put children into education, invest in assets and diversify livelihoods, ultimately facilitating a move to off-farm employment.⁴ Successes have been documented through intensification programmes and the 'Green Revolutions' they have inspired since the 1960s in

CONTACT Neil Dawson  Neil.Dawson@uea.ac.uk  School of International Development, University of East Anglia, Norwich Research Park, Norwich, Norfolk NR4 7TJ, UK

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Asia, Latin America and more recently in Africa.⁵ However, market-oriented intensification is not solely geared towards poverty reduction, but concurrently driven by macro-economic goals to increase national growth and exports. Outcomes are presented in terms of growth in agricultural production and trade, increased yields and average incomes.⁶ Indeed, there are reasons to question impacts on the rural population, and different groups among them. Recent intensification policies considered successful based on economic impacts, including some of those currently in implementation through organisations such as the Alliance for a Green Revolution in Africa, have been shown by in-depth research to have had negative impacts, particularly on the poorest and most marginal groups. These occur through diminished land tenure security, curtailed subsistence production, water pollution and impingements on cultural practices such as seed systems, modes of farming and collection of wild foods.⁷ Yet beyond academic research, the monitoring and evaluation of agricultural development strategies has rarely paid attention to such diversity of impacts on human wellbeing or their disaggregation across social groups.⁸

The sustainable development goals (SDGs) represent a step-change in ambition for raising the wellbeing of the world's poorest.⁹ Above all, SDGs are more far-reaching than Millennium Development Goals (MDGs) in that they seek to eradicate poverty in all forms for all people, meaning associated strategies must seek to improve the lives of the very poorest and most marginalised people.¹⁰ This provides good reason to reassess the impacts of agricultural intensification, which will require evidence of how current practice is aligned with the SDGs or how practice can be changed to better meet these goals.¹¹ SDGs appear to support the strategy of agricultural modernisation through intensification, particularly through Target 2.3 to 'double agricultural productivity and the incomes of small-scale food producers' (see [Table 1](#) for relevant goals, targets and indicators). Rather than focusing solely on national food production and average incomes, the goals, targets and indicators highlight specific social groups, including women and indigenous peoples as well as further aspects of their wellbeing such as food insecurity and land tenure (see [Table 1](#)).¹² SDG indicators not only disaggregate but also pay specific attention to individuals' perceptions of their wellbeing. Corresponding aspects of wellbeing referred to by SDG indicators based on local perceptions include food insecurity, assessed through the Food Insecurity Experience Scale (FIES),¹³ and land tenure security (see [Table 1](#)). Land tenure can be narrowly defined in terms of legally recognised property rights, but the role of customary and communal tenure systems in land governance across developing countries must also be acknowledged. Assessment frameworks should therefore disaggregate forms of tenure and include attention to the various use, control and authoritative rights that may be exercised over land.¹⁴

The specific focus on inclusive social development and local perceptions in SDG indicators suggests intensification with purely macro-economic goals may not promote SDG-compatible development unless accompanied by social safeguards or pro-poor policies. Due to negative social and environmental impacts of market-oriented intensification policies, there have also been calls to focus agricultural development on agroecological forms of intensification, often based on organic inputs, mixed farming systems or agroforestry, with greater emphasis on local food sovereignty.¹⁵

To understand how effective market-oriented agricultural intensification is in meeting SDG 2 to end hunger and malnutrition, we do not need to wait 10 years for SDG indicator data to emerge. Indeed, to lift the poorest out of poverty within the 12 years remaining before 2030 requires more immediate changes in development practice. In this paper, we

Table 1. Selected relevant sustainable development goals, targets and indicators.

Sustainable Development Goal	Target	Indicator
1. End poverty in all its forms everywhere	1.1 By 2030, eradicate extreme poverty for all people everywhere, currently measured as people living on less than US\$1.25 a day	1.1.1 Proportion of population below the international poverty line, by sex, age, employment status and geographical location (urban/rural)
	1.4 By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance	1.4.1 Proportion of population living in households with access to basic services 1.4.2 Proportion of total adult population with secure tenure rights to land, with legally recognised documentation and who perceive their rights to land as secure, by sex and by type of tenure.
2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture	2.1 By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round	2.1.2 Prevalence of moderate or severe food insecurity in the population, based on the Food Insecurity Experience Scale
	2.3 By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment	2.3.1 Volume of production per labour unit by classes of farming/pastoral/forestry enterprise size 2.3.2 Average income of small-scale food producers, by sex and indigenous status.
	2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality	2.4.1 Proportion of agricultural area under productive and sustainable agriculture
	5.a Undertake reforms to give women equal rights to economic resources, as well as access to ownership and control over land and other forms of property, financial services, inheritance and natural resources, in accordance with national laws	5.a.1 (a) Proportion of total agricultural population with ownership or secure rights over agricultural land, by sex; and (b) share of women among owners or rights-bearers of agricultural land, by type of tenure
8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	8.3 Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalisation and growth of micro-, small- and medium-sized enterprises, including through access to financial services	8.3.1 Proportion of informal employment in non-agriculture employment, by sex

'retrofit' indicators for SDG 2, to explore rural inhabitants' perceptions of intensifications which began in 2010 in western Rwanda and northern Laos (the poorest regions in their respective countries). We explore relative impacts on a range of rural inhabitants, in terms of income, food production, food security and land tenure (the four pillars of SDG 2) to reveal their impacts on poor and marginal social groups. We illustrate that although

market-oriented intensification generates poverty reduction, it also intensifies marginalisation and poverty for vulnerable groups, which differ based on the contextual factors influencing social inequality. We discuss the changes in practice that may be necessary to reflect the new global development goals and avoid counterproductively increasing the suffering of some of the poorest people on the planet.

Agricultural transformations in Rwanda and Laos

The two cases were chosen strategically, because in both western Rwanda and northern Laos agriculture has changed dramatically in the last 10 years, from primarily subsistence based traditional forms to commercial production of marketable crops.¹⁶ Infrastructure has improved rapidly, providing access to education, health and other services. Both have a history of conflict and large-scale resettlement: Rwanda in the 1990s, and Laos from the 1960s to 1980s. In Rwanda, refugees resettled alongside longer-term residents, many of whom were temporarily displaced, following the upheaval of the 1994 genocide and subsequent years of civil war.¹⁷ In Laos, after the eventual communist takeover in 1975 and in the wake of continuing civil war, close to one million people were resettled in the 1980s and early 1990s, alongside roads to facilitate inter-ethnic peace-building and more effective governance and development.¹⁸ Both governments have promoted transformation in small-holder practices from subsistence production to use of modern seeds to grow cash crops, therefore intensifying and marketising production. This is a widespread trend that has occurred globally across rural areas in developing countries.¹⁹ Furthermore traditional agriculture has been viewed by both central governments as unproductive and unsustainable and policies have sought to eradicate it.²⁰ There are also ongoing efforts in both countries to formalise property rights for all land owners. There are several broad ethnic categories in each region: in Laos, Lao Loum, Khmu and Hmong-Mien groups (each of which has numerous sub-groups), alongside a small number of ethnic Vietnamese Tai groups.²¹ In Rwanda, a majority of Hutu, approximately 15% Tutsi, which now includes returnees from various neighbouring countries, and the Twa, representing approximately 1% (with many clustered in rural areas near to previously-inhabited forests). Acknowledgement and respect for indigeneity is not a feature of policy in either country, and is essentially downplayed through national identity politics, particularly in Rwanda in the context of post-genocide reconciliation.²² While the criteria for and politics of indigeneity for the 50 plus ethnic groups in Laos is extremely complex,²³ the Twa in Rwanda can more clearly be defined an indigenous group, qualifying under UN criteria,²⁴ and we afford them attention as such a group in our analysis.

In northern Laos, villagers traditionally practise shifting cultivation of rice, the staple food in local diets, which can be stored for the dry season. Hunting, foraging and cultivation in fields, fallows, forests, rivers and wetlands supplements diets with a wide array of seasonal foods year-round.²⁵ In Huaphan Province in the northeast of the country, rice production has, particularly since 2010, been rapidly replaced with maize as a cash crop to supply markets for Vietnamese and Chinese livestock feed.²⁶ The shift has been largely instigated through foreign investors, and local inhabitants may choose whether to adopt the changes or continue cultivating rice. Maize companies have been established which undertake contracts with local farmers and provide credit at preferential rates. This enables farmers to invest in technology while meeting household expenses and food needs during production

of the maize crop. National policies have been put in place to reduce fallow times and sedentarise agriculture for many years but have been weakly enforced, meaning traditional shifting cultivation has continued in practice.²⁷

Rwanda has been labelled a developmental, patrimonial state with land and agriculture policy just one sector that has been highly centralised.²⁸ In the mountainous west, smallholders have traditionally grown more than 60 crop varieties in overlapping cycles, even within the same fields, to maximise the chances of producing a harvest in each season for subsistence and limited exchange in the face of extreme topography and climate.²⁹ In contrast to Laos, the population density in western Rwanda is extremely high, the highest on mainland Africa, meaning that fields are seldom left fallow.³⁰ Since 2004, the Rwandan government has embarked on an ambitious programme to boost production of crops suited for national distribution and for export. The transformation of agriculture has been based on a narrative of crisis for soil fertility, the environment and people caused by overpopulation, with priority outcomes framed in terms of food security and national economic prerogatives.³¹ The Rwandan Land Policy determined all land to be government property, leased by citizens.³² If not used in accordance with policies, land can be seized and reallocated. The Crop Intensification Program then specified which crops farmers could grow in which area of the country and in which season.³³ In the west of the country, modern seed varieties of beans, maize and tea were the primary designated crops. To facilitate this transformation, seeds are distributed to farmers and associated chemical fertilisers made available at subsidised prices. Other important policies geared towards rural transformation include the villagisation policy, seeking to move all remote dwellers into rural centres, a zero-grazing policy requiring animals to be housed, and strict standards for housing and business premises.³⁴ While both Laos and Rwanda effectively have single party systems and authoritarian governments, policies in Rwanda are enforced countrywide by local authorities through a series of incentive mechanisms and system of fines and punishments for non-compliance.³⁵ In Laos national policies are, in contrast, commonly open to local interpretation and negotiation, particularly in remote, rural areas.³⁶ This means villagers in Laos have had greater relative power to choose whether to adopt new crops and intensify production.

Methodology

We employed mixed-methods research to study the wellbeing of different groups of rural inhabitants in both study areas and the impact of change upon them. Our approach was in large part informed by the theoretical synthesis, proposed interdisciplinary methodologies and empirical scholarship produced through the 'Wellbeing in Developing Countries' research programme.³⁷ This body of research explores the subjective and relational dimensions of an individual's wellbeing, as they perceive them, in addition to, and as they interrelate with, material features of a person's quality of life.³⁸ The key concepts comprising wellbeing are illustrated in the multidimensional wellbeing framework, which served to guide research in both countries (see [Figure 1](#)). They are also described below along with the methodology and combined qualitative and quantitative methods utilised to explore them. The first author led fieldwork in Rwanda from October 2011 to May 2012 and in Laos from February 2014 to July 2015. After initial periods of introducing the research and gaining trust among participating villagers, we conducted focus groups and semi-structured interviews in three study

sites within each region (in total with individuals from 100 households in Laos and 165 in Rwanda). Relationships with participants were fostered through ethnographic methods conducted while residing in the study sites, including participant observation, landscape walks with local inhabitants and life history interviews. These informed focus groups and interviews with people from various ethnic groups present in each region, as well as female heads of households (see [Table 2](#)). The numbers from each ethnic group were not selected so as to be statistically representative of the wider or national population (see previous section), but rather to capture the social and ethnic diversity typical within rural areas of those specific regions of Rwanda and Uganda.

Focus groups explored local priorities in terms of the aspects of people's lives (whether health, social relations, employment, infrastructure, for example) and different forms of resources considered as key for living a good life, and the most significant changes impacting people's lives over the previous decade. Semi-structured interviews (see template in Supplemental data) were used to both quantify and qualitatively document interviewees' perceptions of the resources (social, cultural, human, economic and natural) they and others in their household had access to and the quality of life or wellbeing outcomes they attained, including their ability to meet basic human needs. Interviews were also leveraged to explore and characterise the social and cultural values and interactions held as important, the levels of agency exhibited (or feelings of competence to act in pursuit of their own wellbeing) and the ways in which these affected an individual's perceptions of and gave meaning to their wellbeing (see [Figure 1](#)). Additionally, interview questions investigated (and where possible quantified) changes in people's wellbeing over the preceding decade (six to nine years before the start of the agricultural transformations) and the multiple drivers of those changes, whether economic, social, political or environmental (see [Figure 1](#)). We therefore did not assume all trends to be attributable to the agricultural transformations but explored people's lives and feelings about their quality of life in that specific context relatively openly and holistically.

Through applying this framework, we pre-emptively measured a range of SDG indicators, including incomes and employment, agricultural production, food insecurity and land tenure (see [Table 2](#)). We recorded all income streams for each household and the approximate income they yielded, as reported by respondents. Rural livelihoods are extremely diverse and more than 25 different income streams were identified across sample households in Rwanda alone. Members of a rural household commonly engage in several of these income-generating activities at the same time. We used this understanding to divide occupation type for each household into four categories: (1) those reliant only on subsistence agriculture or manual agricultural labour which generally provided the lowest and least regular income; (2) those dependent on other labouring work such as labour in tea plantations, building/carpentry, charcoal making and security work as a main income (which commonly provided low and insecure, yet higher and more regular, wages than farm labour); (3) self-employed people who manage their own crop, natural resource or woodlot trade, who have a small trading business or received remittances from relatives who did; (4) professionals such as builders, teachers, administrators, soldiers, mechanics or drivers, who derived higher and much more secure and regular incomes. Off-farm employment options, often involving temporary migration, were increasing in both regions and we took care to ensure such occupations were captured. For agriculture, we recorded the type of crops grown and level of trade versus subsistence for each. This enabled us to build an estimate of annual incomes.

Table 2. Socio-economic indicators by ethnic group and gender of household head.

Occupation category	Laos (n = 100 households)					Rwanda (n = 165 households)				
	Lao Loum (n=41)	Khmu (n=55)	Tai (n=4)	Female-headed households (n=5)	Average (n=100)	Long-term residents (Hutu, n=120)	Returnees from DRC (Tutsi, n=28)	Twa (n=17)	Female-headed households (n=33)	Average (n=165)
Subsistence agriculture or agricultural labour only	0%	0%	0%	0%	0%	14%	4%	53%	21%	16%
Small-scale trade of crops, goods, other manual labour (tea, building, charcoal, forestry)	52%	37%	0%	40%	41%	60%	64%	47%	70%	60%
Self-employed farmers, traders, transporters	24%	47%	50%	40%	38%	6%	3%	0%	6%	5%
Professionals and highly diversified households (e.g. builders, teachers, soldiers, administrators, mechanics, drivers)	24%	16%	50%	20%	21%	20%	29%	0%	3%	19%
Proportion of informal off-farm employment	45%	35%	100%	20%	41%	33%	25%	6%	12%	28%
Income poverty (< US\$1.25 per adult per day)	51%	35%	0%	40%	40%	73%	68%	100%	91%	75.2%
Land holdings (in hectares, range and standard error in parentheses)	0.90 (0–1.69)	1.76 (0–3.5)	1.67 (0.77–2.61)	0.87 (0.43–1.23)	1.40 (0–3.5, 0.08)	0.68 (0–8)	1.73 (0–8)	0.22 (0–1)	0.72 (0–7)	0.81 (0–8, 0.10)
Food insecurity (according to Food Insecurity Experience Scale)	32%	27%	50%	60%	30%	40%	25%	6%	33%	34%
	68%	73%	50%	40%	70%	32%	21%	0%	9%	27%

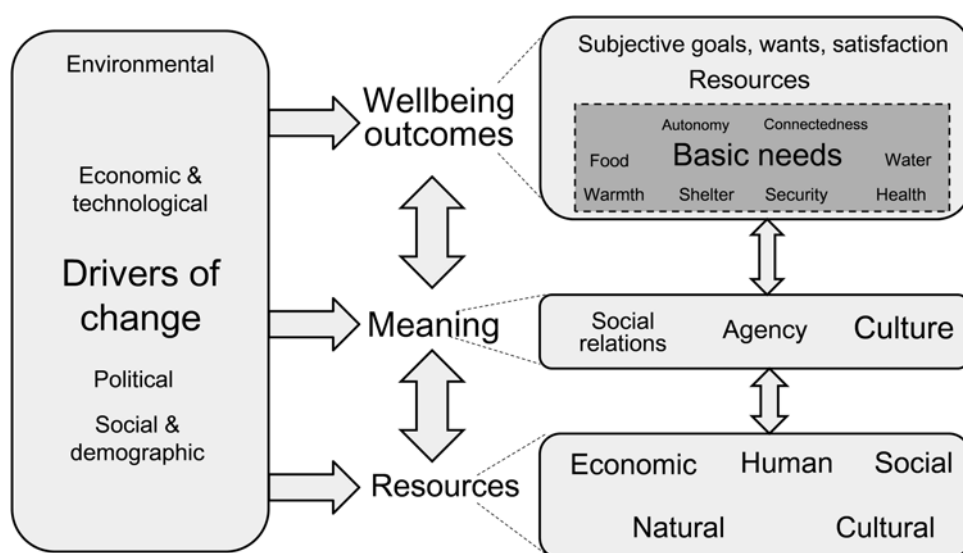


Figure 1. A conceptual framework for the study of multidimensional wellbeing and drivers of change.

By dividing total incomes by the number of adults per household we could determine which households fell below the international poverty line of US\$1.25 per adult per day. We further quantified land holdings for each household, alongside other resources such as housing, technology, sanitation and any loans or debts held. People's ability to meet basic needs, including adequacy of access to food, was also recorded, in terms of whether they could produce or afford different types of food for a healthy diet, if they ran out of food, what they did to deal with such situations, and if members of the household regularly skipped meals or needed to go entire days without food. This provided a measure comparable with the Food Insecurity Experience Scale adopted as an indicator for SDG target 2.3 (see Table 1).³⁹ These variables were analysed by ethnic group and separately for female-headed households, which accounted for approximately 14% of the sample, although these were mostly in Rwanda (see Table 2).

We recorded changes in occupations, incomes, land size, agricultural production and food insecurity over the previous 10 years based on participant recall. Recall may in some instances provide inaccurate results.⁴⁰ However, we discussed the numbers reported and years in which changes were reported to have occurred within the interviews for further corroboration. We also investigated perceived reasons for those changes in detail to validate answers and enable attribution of changes to various drivers, including the recent changes in agriculture. In the following sections, we present results from application of these methods in Laos and then Rwanda.

Impacts of agricultural intensification on poverty and wellbeing in northern Laos

In Laos, all study respondents reported recent, rapid improvements in material wellbeing and poverty, identifying maize cash-cropping as the primary driver. Prior to this switch to maize, farming incomes were very low and, due to poor infrastructure and transport options,

there were few opportunities for off-farm income: 'There wasn't any money before maize! We didn't make any'. A total of 38% of households had previously sold rice, though in small quantities and for a low price of around US\$62.50 per ton, with most of the average 3.92 tons produced per household per year used for subsistence. Some households not selling crops had earned income from forest products, but again at low prices as markets were limited. Only the 20% of households with salaried professionals had earned incomes above the international poverty threshold of US\$1.25 per adult per day or US\$456 per year.

Between 2010 and 2014, 91% of households adopted maize as their primary crop. Consequently, average farming incomes rose sharply over a very short timescale, to approximately US\$900 per year in 2014. Based on changes in income this appears to represent rapid and inclusive income generation, though as described below multiple additional impacts meant this did not translate to inclusive poverty alleviation. Maize production averaged 7.12 tons for the 91% of households adopting it. This did not entirely replace rice production. Indeed 88% still produced an average of 1.98 tons of rice in 2014, and 10 continued to sell some of their rice harvest. The nine households who were not growing maize were mostly traders who did not farm.

The improvement of infrastructure and market links, accelerated by the boom in maize production, enabled cash from sales of non-timber products (such as broom grass, mushrooms and bamboo grubs) to increase and further diversification of livelihoods. A total of 77% of households were selling natural resources foraged from the surrounding landscape, averaging US\$174 per annum. A total of 41% of households also made income from non-farm activities, including construction, factory work and forestry. Total average annual household income was US\$1623 in 2014, equating to US\$696 per adult or US\$1.91 per day (above the US\$1.25 per day international poverty threshold and the US\$1.90 adjusted threshold). The increased incomes and credit provided by maize companies led to considerable investment in assets, with very visible advances in the region. In 2014, 85% of households owned televisions and 78% owned motorbikes compared to fewer than 20% prior to 2010. A total of 29% had modernised their houses since 2010, often using manufactured bricks, concrete and metal roofs rather than harvested materials.

Despite advances in income and material resources resulting from the agricultural transformation, impacts varied. A total of 40% of households continued to earn below US\$1.25 per adult per day. Switching from subsistence production of rice to grow maize as a cash crop brings pressures and risks as well as opportunity. Crop raiding by mice, rats and wild pigs among others impacts more on maize than rice harvests, requiring labour, usually adults, to guard the crop or traps to deter wild animals: 'It is as if the maize traders brought the rats here in their trucks!' Maize can be susceptible to extreme wet or dry weather and requires sufficiently fertile soil to ensure a good harvest, often achieved through field rotation, thus favouring smallholders with relatively more land. Smallholders need to be able to sell enough of their maize harvest to pay off any debts as well as to afford sufficient rice for their household's ongoing subsistence needs. At the same time, the transformation of agriculture across the wider region has driven the price of rice upwards. The risks in switching to maize production were therefore greatest for those who lacked capital, land that was good quality and easily accessible, and alternative income streams: 'it is unfair because those who have more land have more capacity to improve. But the poor can't, they want more, they want to improve in the same way, but they have no ability to make that happen'. Rather than alleviating poverty and improving lives for all, maize production has led to difficulties for those

with limited material and social resources to draw on. One mother even blamed the death of her four-year-old son from disease on the additional burdens they had taken to try and grow maize and lack of time or disposable income to travel and pay for medical attention: 'I think he died because we cleared the forest to grow maize ... a few [like us] in the village have little land, owe money and can't produce enough'. Yet, rather than continuing to produce rice, many poorer households have taken risk and debt to produce maize, viewing it as a limited opportunity to rise out of poverty, afford their children's education and secure alternative employment in the future. Household debt, almost absent 10 years earlier, became very common alongside maize growing. A total of 73% of households held loans, taken primarily from the maize companies, at an average of US\$411, which, because of requirements to repay with interest in the following year, served to offset a proportion of the increase in gross incomes and alleviation of income poverty. Debts are not confined to those who have benefitted from maize: of the 40% remaining poor, 31 held debts at an average of US\$388.

In terms of food insecurity, 30% of respondents ran out of rice for their household and had insufficient available money to pay for the shortfall, which would be categorised as suffering moderate levels of food insecurity in the Food Insecurity Experience Scale (see [Table 2](#)). Local social protection mechanisms were in place enabling them to borrow rice from neighbours or village stocks but borrowed rice must be repaid the following year, commonly at a rate of 50% interest. On average, rice supplies for those 30% of households were reported to last just 6.7 months of the year, and for some as little as two months. Of those 30%, less than a third stated that they had suffered similar food shortages prior to growing maize, due to issues of lack of land or labour. Households in this situation are beginning to turn away from maize and back to rice. Even though annual incomes may be much higher than in the past, more people struggle to meet the basic human need of sufficient food, in this case lacking rice, their staple dietary component. This represents an important form of poverty. Foraging and hunting in fields, fallows, rivers and forests remained important activities for subsistence and quality of diet, despite some expansion of maize production into these habitats, with a wide variety of protein and vegetables providing important nutritional intake to supplement rice.⁴¹

The division between income poor or food insecure households and non-poor does not relate to ethnicity or gender (see [Table 2](#)). Although our sample included only five female-headed households in Laos, 32% of the 41 instances of off-farm work among the 100 households were performed by women. Female respondents stated that the improved technology such as electricity, motorbikes and tractors, in part facilitated by the shift to maize production, had greatly reduced the time they spend performing manual tasks and enabled them to work more alongside their husbands or take other forms of employment. Across South East Asia, women tend to have relatively equal capacity to claim land and resources, particularly in comparison to sub-Saharan Africa.⁴²

Whilst the gender and ethnicity of the household head were not found to explain widening wealth divisions in Laos, we did see evidence that marginalisation was resulting from more complex historical social inequalities. Our study villages had been relocated from more remote locations during the 1980s and 1990s, a process that involved mixing people from different villages and ethnic groups, and also staggered arrivals such that some people were already established in new villages prior to later arrivals. This restructuring of rural society led to complex forms of social division that shaped the allocation of land, with high quality

and accessible land commonly claimed by those arriving earliest. One farmer described how 'we came to the village quite late (relative to other resettled groups) so only got left with land far away. People already owned all the land near the village'. For shifting cultivation, people would claim multiple fields and fallows, covering a greater area than used in a single season. Gaining access to land often involved newer arrivals asking permission to temporarily use fallow land informally held by longer-term residents. Those with broad social networks and connections to those with greater lands or village leaders could secure tenure over more fields, sometimes by acquiring land as others left or became old. However, where people were socially marginalised, their access to land, quality and accessibility of fields and security of tenure remained weak. Ownership then became more defined and less flexible as populations grew, government policy sought to sedentarise farming and formalise tenure and rural populations became more market-oriented. This denied land use rights to those who are poor and lacking social capital: 'we asked the village head (for more land) but ... suddenly people had reserved all the land for themselves'. Village leaders retained limited influence over allocation of land, with distribution competitively regulated by individuals. Those on the margins thus found themselves with relatively little and unable to make maize production generate enough income to improve their position. Although the average size of land per household was 1.4 hectares, 17 households had less than a hectare (average 0.68 ha), were reliant on land for their income and, despite having labour capacity to farm more land, continued to live on less than US\$1.25 per adult per day. These households represent a section of society that have become relatively, and absolutely, worse off under the agricultural changes. In the following section, we describe the impacts of agricultural transitions on rural Rwandans and explore similarities and differences to Laos in the processes influencing them.

Impacts of agricultural intensification on poverty and wellbeing in western Rwanda

Levels of poverty were high among households in western Rwanda. A total of 75.2% of households in our sample earned less than US\$1.25 per adult per day (see [Table 2](#)). There were few opportunities for higher-earning occupations such as tea plantation or construction, meaning that three-quarters of people were reliant on low paid labouring opportunities for income and subsistence agriculture for food: 10% did not grow any crops as 4% were landless and 6% had chosen to grow trees on their land to sell as charcoal and planks. Although 90% farmed crops, only 34% traded any of them in 2011–2012. Hence, subsistence agriculture was of great importance to meet their nutritional needs. Population density is very high in western Rwanda relative to Laos, meaning that there is very little common land remaining to provide opportunities to forage, hunt for food. Nor is there a forest frontier for potential conversion to agriculture.

Intensification in western Rwanda followed a different model from northern Laos in that the changes were driven by national policies and strongly promoted by local government officials aiming to meet targets for adoption. Modern inputs were subsidised rather than credit being provided which would cover those costs. Seeds were provided for free while the associated chemical fertilisers for each crop were made available at a reduced price, albeit a substantial one representing several months of wages at local daily labouring rates. Similar models for intensification are evident across the region.⁴³ The Rwandan version differs

to some other examples in that it involves limited choice of whether smallholders adopt the measures. Even if a household could not afford the chemical inputs, all were required to grow the approved crops in each season or risk fines, potential destruction of crops or even seizure and reallocation of land for non-compliance.

The agricultural transformation had only a limited positive effect on the incomes of the wealthiest households, as harvests were commonly constrained by climate and pests. Indeed, the approved crop types were widely considered to be poorly suited to the soils, susceptible to failure in the face of an extreme and variable climate, and unlikely to yield positive results: 'we are told to grow things that aren't suitable to grow here. When we try to grow things that are suitable we are punished for it'. On the other hand, many of the poorer households faced increased risk and vulnerability through growing them, due to impacts on subsistence farming and tenure insecurity caused by the policy. While all farmers were obliged to begin using seeds provided as part of the Crop Intensification Program, only 52 out of the 165 households (32%) had started using fertilisers provided. Most of the remaining 68% stated that they simply could not afford them, and this was particularly the case for the 16% reliant on low-paid, sporadic agricultural labouring opportunities (see Table 2). Negative perceptions of the policy and its impacts were frequently voiced when interviewees were asked 'Have you made any change to your farming methods?' Only six households stated support for the policy whereas 68 stated they had been negatively impacted by the new agricultural regulations.

People were negatively affected by the impacts of this policy on subsistence production and tenure security. Production of a wide variety of crops for subsistence and some local exchange was a key response to extremes of climate and topography, an adaptation which had evolved to minimise the risk of producing nothing and suffering hunger in consequence. Most locals perceived the idea of monocropping to produce only a single harvest in each season to carry risks of more pests, erosion and flooding: 'preventing us mixing crops has caused difficulty because we used to be able to harvest others when one crop failed. The effect of that policy is starvation and an increase in prices at market'. Regarding tenure security, access to land to produce food was put forward in focus groups as the key resource for living a good life in the context. However, inequality in land holdings was high and increasing. A total of 52% of households held less than half a hectare of land and 12% of households owned more than 50% of the total area of farmed land. A total of 37% of households saw their access to land decrease over the 10 years to 2012, but in contrast 19% of primarily non-poor households had been able to increase their holdings over the same period, suggesting a concentration of land in the same hands. This was only explained by resettlement and provision of land to children or returnees for 4% of the sample. Intensification of land use and reductions in livestock resulted in a perceived loss of soil fertility and falling harvests, meaning that rural inhabitants wished for support for maintaining harvests, for example through anti-erosion measures such as terracing or provision of manure or livestock. A 2005 policy restricting grazing livestock to enclosures alongside houses,⁴⁴ contributed to a decrease in the production of manure to aid crop production. Indeed, 37% of respondents reported having lost their crop trade in the last 10 years through reductions in land holdings caused by expropriation by the government and sales to meet housing, medical or educational needs. The policy requirements to grow specific types of crops and to eradicate traditional crops and farming methods supported wealthier, land-rich households and exacerbated these negative trends for the poorest. Respondents commonly stated their

reasons for selling land to be the constraints on the ability of households to subsist and the potential for the government to reallocate their land to wealthier households who could afford the subsidised inputs and adhere to the new policies. Tenure insecurity was a significant concern for farmers, 10% of whom reported having been dispossessed of land during the previous 10 years. Three households had lost land during the past year as a direct result of the intensification programme. Thus, the formal titling and certification system that has accompanied intensification has not strengthened tenure security.

Counterintuitively, these negative impacts upon subsistence production, land tenure security and wellbeing may result in higher incomes among the rural population, as many people are pushed into labouring. Although such labour generates income, it provides low and uncertain wages and dependence upon landowners for work, which in the absence of subsistence production is required to enable their families to eat. Rising incomes therefore contrast with other indicators including food security and perceptions of tenure security. Food security was perceived to be worsening and the agricultural policies were reported to be a contributing factor. 39% of the Rwandan households faced severe food insecurity, having to go at least one day per month without eating due to lack of food and 34% faced moderate insecurity, being restricted to eating only certain types of food (73% of moderately food insecure households ate meat very rarely).

Here we demonstrate that inter-household differences in impacts of agricultural policies in Rwanda relate not to the amount of land owned but to complex dynamics of social inequality, as with the Lao case presented above. Among the different social and ethnic groups within rural Rwanda, income poverty, land scarcity and food insecurity were particularly prevalent for the Twa and for female headed households (see [Table 2](#)). All Twa households in our sample suffered income poverty, with 53% solely reliant on agricultural labouring due to negligible land holdings and 94% facing severe food insecurity. Many Twa had been provided with land and housing as they had been evicted from their traditional homes in forest areas, some as recently as 2008, and moved from their grass-roofed huts as recently as 2011. Yet instead of being able to adapt and farm productively, the majority wished to return to their old homes. They sold their land because they had no livestock and manure to aid cultivation and spent the money on food and household goods, only able to find menial jobs when they needed money again. Through their trade and exchange of natural resources and forest products, the Twa had always interacted with other groups, but they were treated as far from equal, even though over time relations had shifted from physical abuse and discrimination to just discrimination. Even among our small sample of Twa households, there were examples from the past five years of significant amounts of wages, livestock and equipment being stolen collectively by non-Twa who acted as organisers of cooperatives and projects for them (for example, their radios were taken away from them because 'pygmies won't know how to use radios'). They voiced resentment at not being considered for higher paid types of work, even unskilled jobs such as cleaning or security guards: 'they are the same like us but we aren't chosen for that work, you can't find a pygmy working there. Having durable employment doesn't require just studies, your ethnicity is a factor'. They were rarely involved in organisations alongside non-Twa such as local honey cooperatives, although honey was an important forest resource to them.

Female headed households were also disproportionately poor, with 91% living on less than US\$1.25 per day and 53% suffering severe food insecurity compared to sample averages of 75% and 39% (see [Table 2](#)). Only 3% had professional occupations compared to 23% of

male headed households. One of the major causes of this inequality, contrasting with Laos, was the prevalence of polygamy in rural Rwanda, with 10% of household heads in polygamous relationships, accounting for half of the female-headed households. One woman described how 'even though I cultivate the small piece of land I have, my husband comes and takes the stored part of my crops ... [for] his other wife'. In such instances, males commonly controlled the land of multiple households, even when mostly absent, and in the event of the husband's death, the husband's family members staked claim to it. Such aspects of inequality within family groups may not be clear through household survey data. Thus, although tenure security was a common factor determining experiences of agricultural policies in Rwanda and Laos, social inequality based on ethnicity and gender played a greater role in determining access to resources in Rwanda, with processes of marginalisation differing in Laos. In the following section, we discuss implications of our findings regarding differentiated impacts of agricultural intensification policies for strategies more aligned with the SDG agenda.

Implications for agricultural intensification in the SDG era

Agricultural intensification is widespread as a trend and development intervention. Yet the compatibility of this strategy with the SDG agenda is not well understood. Our analyses from recent agricultural transformations in Laos and Rwanda highlight a gulf between the outcomes of current mainstream practices based on market-oriented agricultural intensification strategies and the ambitious, inclusive ambitions of the SDGs. Interventions in Rwanda and Laos have been deemed successful in terms of increased production of marketable crops and aggregate increases in gross incomes and have generated pathways to poverty reduction for some. However, our nuanced analysis of policy impacts reveals the policies fail to reach many of the poorest rural inhabitants and serve to intensify marginalisation and poverty for a substantial proportion of the poorest people in each country, experienced primarily through reduced land tenure security in various forms.

In Rwanda, rural inhabitants experienced loss of control and authoritative rights to land as a direct consequence of intensification policies, while in Laos changes culminated in restricted use rights for poorer households. This in turn disrupted subsistence production and exacerbated food insecurity. The contextual factors determining who suffers varied by country, with ethnicity and gender important factors in Rwanda, while in Laos post-conflict social engineering policies are influential. Attention to the context-specific processes causing and reproducing poverty, beyond indicator-based assessments, are critical to inform strategies to address deprivation among marginal social and ethnic groups.⁴⁵ However, SDGs have been criticised for lack of influence of minorities through their limited participation in international and national processes, and lack of culturally-sensitive development solutions.⁴⁶ Although our findings stem from only two cases, the particular details of which we do not claim as representative, numerous other studies have revealed similarly negative social impacts from similar, widespread market-oriented agricultural intensification strategies, deemed successful based on limited assumptions and evaluation criteria.⁴⁷ Findings from our case studies, which are novel in presenting the impacts through SDG targets and indicators, may therefore be indicative of a prevalent divide between mainstream agricultural intensification strategies being enacted across the developing world and the recently

articulated global sustainable development agenda, including ambitions to eradicate poverty and hunger and improve the wellbeing of the world's poorest.

Indicators are required to represent and quantify the impacts of changing practices and policy interventions upon different people. Some of the impacts detailed in our study can be captured through micro-scale monitoring and social disaggregation. SDG indicators, particularly inclusion of the FIES, serve to better elaborate these dynamics because negative trends may expose disruption of subsistence practices or reduced wild food availability, enabling adaptation to counter these effects. It is important that such emerging, progressive indicators, use of which may be inhibited by lack of data and capacity to collect it, are utilised to complement more common metrics and not subordinated.

Local struggles for justice and rights often centre on recognition of customary and communal land tenure for indigenous peoples and local peasant communities in the face of policies implemented by powerful interest groups such as multinational corporations and states.⁴⁸ To date, land tenure security has been afforded little attention in impact evaluations for far-reaching interventions that transform livelihood practices of rural populations. SDG indicators go beyond MDGs to include attention to property rights of different social groups (a poor-proxy for tenure on its own) plus, crucially, different forms of tenure and perceptions of tenure security.⁴⁹ Yet it remains to be seen how these different facets of tenure are to be measured, assessed and operationalised. A measure based on local perceptions of land tenure security, akin to the Food Insecurity Experience Scale, which goes beyond legally recognised property rights, could enhance the representation of the lived experiences, rights and struggles of local communities, and vulnerable social and cultural groups among them. This would support a more ideational perspective in the SDGs, as advocated by other authors.⁵⁰ Such details are far from trivial: 207 land and environmental rights defenders were killed across the world in 2017, with agribusiness considered the most dangerous sector ahead of mining.⁵¹ Many of these deaths were recorded in countries considered by conventional measures to be on a successful pathway towards sustainable development, and such tragic events show no signs of decreasing globally. These contradictions, and further risks to rural households including increasing levels of indebtedness in order to commercialise farming, are not well captured in the SDGs. These omissions require an open and accountable discussion of the norms underpinning them in international and national processes, and provision of national reports to show whether and how those risks, rights and injustices are being addressed.⁵²

Conclusions

A shift from development as modernisation towards a human development paradigm, with attention to perspectives of those at the heart of food production and natural resource management, is evident in the SDGs.⁵³ However, debates about what defines agriculture as productive, sustainable, developmental, pro-poor or socially desirable have been surprisingly absent from SDG discussions. This serves to support business as usual, for example with similar policies to the past being implemented through the renewed drive for a Green Revolution in Africa. In the SDG era, policy strategies in forms akin to the Rwandan model, which effectively exclude some of the poorest and most marginal, should be avoided. Evidence of their impacts on the tenure security and wellbeing of the poorest and most

marginalised people from studies such as this one can be used to guide future policy directions and considerations of best practice. The minimum changes required include safeguards to ensure avoidance or mitigation of negative impacts on tenure, traditional knowledge systems and subsistence production for vulnerable groups. To support more inclusive outcomes, poor and marginal rural groups, such as the Twa in Rwanda, require use rights to land and capacity to manage it through pro-poor initiatives, group-specific communal land associations or subsidised rental schemes. The capacity to invest in and manage land effectively for food production and economic gain requires secure tenure, control and authoritative rights. These may better support their wellbeing and free them from the expectation of expropriation by local elites, patriarchs or the state. Further supplementary solutions, which could better safeguard the interests of the poor, include social protection systems, social transfers providing safety nets, targeted work opportunities, credit access, market support and enhanced participation and representation.

Ultimately, a strategic shift may be required away from productivity maximisation towards alternative modes of agricultural production to enhance environmental sustainability and developmental outcomes. Alternative options successfully implemented in multiple countries, though at scales smaller than intensification programmes, include agroecology incorporating mixed farming, agroforestry systems compatible with traditional farming practices, and tenure regimes, which emphasise local objectives such as food sovereignty over national scale food production targets.⁵⁴ Changing the way governments, global businesses and markets work in a multi-billion-dollar field is far from straightforward for civil society organisations, including the United Nations, as strategies are underpinned by deeply entrenched interests with powerful normative support.⁵⁵ However, combating poverty, inequality and hunger will necessitate innovation if not transformation in agricultural policy strategies and the global institutional structures that control and govern them. Progressive incorporation of local perspectives, values and needs in national indicators and through integrated and deliberative monitoring, reporting and evaluation at subnational scales is a small but essential step. Providing more holistic, contextually-relevant and disaggregated evidence of social impacts can trigger debate and contribute to a long-term normative transition towards more socially just and environmentally sustainable agricultural development.

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ORCID

Laura Camfield  <http://orcid.org/0000-0002-0165-9857>

Notes

1. Christiaensen et al., "(Evolving) Role of Agriculture."
2. Rockström et al., "Sustainable Intensification."
3. Perfecto and Vandermeer, "Biodiversity Conservation in Tropical Agroecosystems."
4. Pretty et al., "Sustainable Intensification in African Agriculture."
5. Evenson and Gollin, "Assessing the Impact."
6. Diao et al., "Agriculture in African Development."
7. Rasmussen et al., "Social-ecological Outcomes of Agricultural Intensification"; Dawson et al., "Green Revolution in Sub-Saharan Africa"; Van Vliet et al., "Trends, Drivers and Impacts"; Abro et al., "Agricultural Productivity Growth"; Chaifetz and Jagger, "40 Years of Dialogue."
8. Garnett et al., "Sustainable Intensification in Agriculture"; Peters, "Challenges in Land Tenure."
9. Biermann et al., "Global Governance by Goal-setting."
10. Pogge and Sengupta, "Assessing the Sustainable Development Goals."
11. Costanza et al., "UN Sustainable Development Goals."
12. Freistein and Mahler, "Potential for Tackling Inequality."
13. Smith et al., "The World's Food Insecure."
14. Sikor et al., "Property Rights Regimes."
15. Altieri et al., "Agroecologically Efficient Agricultural Systems"; Montagnini and Metzler, "Contribution of Agroforestry to Sustainable Development Goal," 2.
16. Clay, "Agro-Environmental Transitions"; Vongvisouk et al., "Rush for Cash Crops."
17. Takeuchi, "Features of Land Conflicts."
18. Evrard and Goudineau, "Planned Resettlement."
19. Tilman et al., "Global Food Demand."
20. Fox et al., "Policies, Political-Economy"; Van Damme et al., "Agricultural Innovation."
21. Evrard and Goudineau, "Planned Resettlement."
22. Ingelaere, "Peasants, Power and Ethnicity."
23. Fox et al., "Policies, Political-Economy."
24. Beswick, *Democracy, Identity*.
25. Broegaard et al., "Wild Food Collection."
26. Vongvisouk et al., "Shifting Cultivation."
27. Broegaard et al., "Contradictory Land Use Plans."
28. Harrison, "Rwanda."
29. NISR, *National Agricultural Survey 2008*.
30. Verdoodt and Van Ranst, "Environmental Assessment Tools."
31. Dawson et al., "Green Revolution in Sub-Saharan Africa."
32. ROR, *National Land Policy*.
33. MINAGRI, "Strategies for Sustainable Crop Intensification."
34. Newbury, "High Modernism."
35. Ingelaere, "The Ruler's Drum."
36. Lestrelin et al., "Territorialising Sustainable Development."
37. Gough and MacGregor, *Wellbeing in Developing Countries*.
38. White, "Analysing Wellbeing."
39. Smith et al., "The World's Food Insecure."
40. Dex, "The Reliability of Recall Data."
41. Broegaard et al., "Wild Food Collection."
42. Akter et al., "Women's Empowerment."
43. Pretty et al., "Sustainable Intensification in African Agriculture."
44. Klapwijk et al., "One Cow per Poor Family."
45. Cleaver, "The Inequality of Social Capital."
46. Enns et al., "Indigenous Voices"; Sims, "Culture, Community-oriented Learning."
47. Ansoms et al., "The Rwandan Agrarian Modernisation"; Rasmussen et al., "Social-ecological Outcomes of Agricultural Intensification"; Van Vliet et al., "Trends, Drivers and Impacts"; Abro et al., "Agricultural Productivity Growth"; Chaifetz and Jagger, "40 Years of Dialogue"; Peters, "Challenges in Land Tenure."

48. Schlosberg and Carruthers, "Indigenous Struggles."
49. Ribot and Peluso, "A Theory of Access."
50. Pogge and Sengupta, "Assessing the Sustainable Development Goals."
51. Global Witness, *At What Cost*.
52. Briant Carant, "Unheard Voices."
53. Protopsaltis, "Deciphering UN Development Policies."
54. Scherr and McNeely, "Biodiversity Conservation"; Roman-Alcalá, "Conceptualising Components."
55. Telleria, "Power Relations?"

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