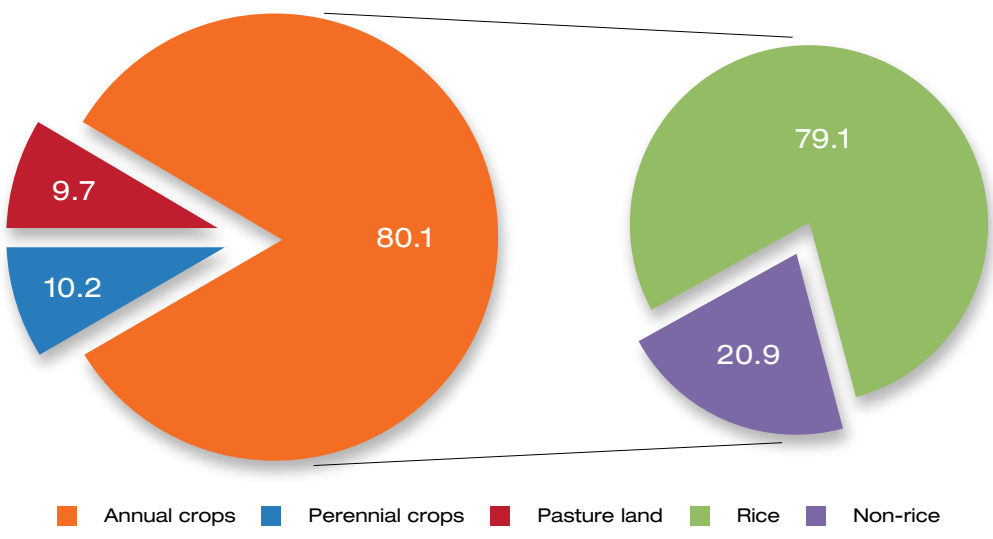
CROPS

C1 Ratio of perennial to annual wet season crops

Introduction

In total, 1.19 million ha or 80 percent of all agricultural land in the Lao PDR (1.49 million ha) is used for planting annual crops. Of this, 0.94 million ha (79 percent) is under rice cultivation. Another 0.15 million ha (10 percent) of agricultural land is devoted to cultivating perennial crops and the remaining 10 percent or 0.14 million ha is used as permanent pasture. Figure 2 shows the area under perennial crops, annual crops and pasture land as percent of total agricultural land.

Figure 2: Percentage of area under perennial crops, annual crops and pasture land



Most annual crops grown in the Lao PDR are grown at small scales and predominantly for household consumption; however, an increasing number of annual crops such as cassava, maize, sweet corn and sugarcane, are grown at larger scales to supply growing international market demand and also domestic agro-processing factories. In contrast, perennial crops planted are often associated with large capital investment and normally invested in by wealthy farm households with sufficient land and capital or by foreign investors. Supported by national and international development policies and programs, there has been increasing cultivation of various perennial crops, including rubber and coffee, for commercial purposes (e.g. through the "Turning land into capital" strategy which encourages land investments).

Patterns in 2011

The two maps display the ratio of perennial to annual crops during the 2010 wet season at three different administrative scales. In most regions, a much higher proportion of land is devoted to annual crops than to perennial crops, but the ratio of perennial to annual crops cultivation in Phongsaly, Luang Namtha, Oudomxai and Bokeo in the north, and also in the south on the Bolaven Plateau, in Champasak, Xekong and Salavan is higher than in the other provinces. Additional information about the total used agricultural area in ha per province is indicated by the size of the circles.

At the district level, more details can be detected. Only 4 of all 143 districts in the Lao PDR have a higher share of perennial crop cultivation than annual crop cultivation, namely Pakxong District on the Bolaven Plateau, Thateng District in Xekong, and Bounneua and Phongsaly Districts in the far north of Laos. In 6 additional districts, which are also located in these two regions, a nearly equal amount of land is devoted to perennial and annual crops.

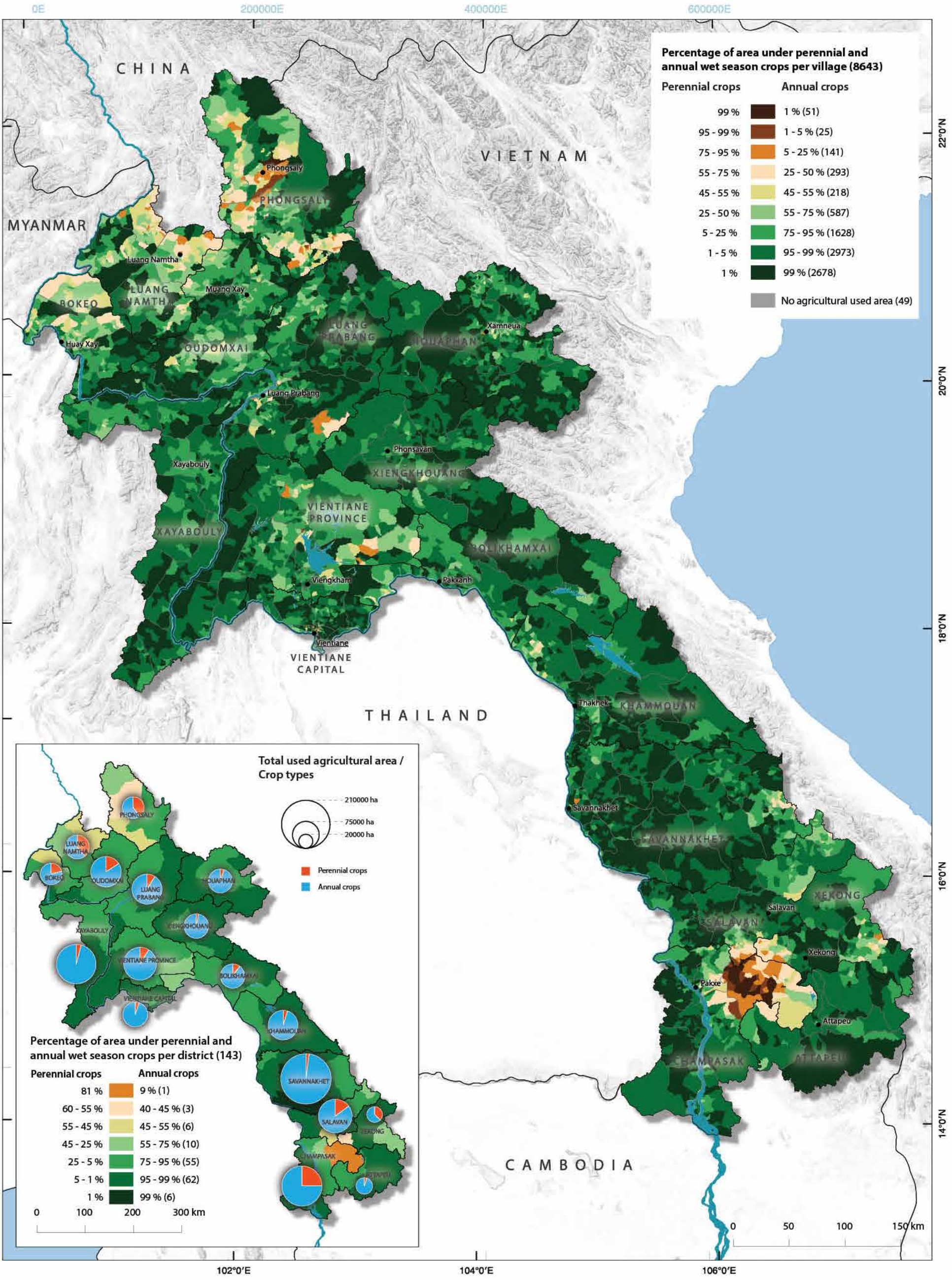
At village level, as shown on the main map, the ratio of area under perennial and annual crop cultivation can be seen at an even more fine scale. In the far north of Laos, the region bordering China stands out. These regions are heavily invested in rubber cultivation in Luang Namtha (see C20) and, to a lesser degree, in cardamom and tea cultivation in Phongsaly (see C23 and C24), hence the high share of area under perennial crops in these regions. Agricultural activities on the Bolaven Plateau centre on extensive coffee production (see C21), but also some cardamom cultivation, hence the high percentage of area under perennial crops there as well.

Interpretations

As smallholders with limited land holdings and cash constraints, the majority of Lao famers opt to cultivate annual crops rather than perennial crops to achieve their livelihood needs and earn immediate income. Perennial crops often require higher capital investment, specialized technical and managerial knowledge, as well as market access to ensure decent financial returns. They also take far longer to produce, which increases risk compared to annual crops.

The demand for perennial crops is on the rise in both domestic and international markets. Drivers of the rise in demand are related to national and international policies, global trade, population growth, and changes in people's consumption habits. As a result, agricultural households in northern Lao PDR and on the Bolaven Plateau have devoted much of their agricultural land to perennial crop production, in particular to rubber and coffee for which neighbouring country markets have high demand.

C1 Ratio of perennial to annual wet season crops



C2 Area and number of households of annual and perennial crops

Introduction

In the past decade, household cropping systems in the Lao PDR have increasingly diversified such that farmers now grow a large variety of crops aside from rice. From 1999 to 2011, the prices of certain cash crops increased, some stagnated, and some decreased, but there has been an overall increase in engagement in cash crop cultivation.

Across the country, the planting areas of both annual and perennial crops increased significantly from 1999 to 2011. And while a number of perennial cash crops are increasingly cultivated, most land is devoted to annual crop production for both household consumption and for sale. About 95 percent of all farm households in the Lao PDR grow annual crops on about 1.19 million ha, of which 0.94 million ha (or 79 percent) is under rice cultivation. Around 47 percent of all farm households plant perennial crops on a total area of 0.15 million ha.

Patterns in 2011

Map I: Agricultural households cultivate annual crops either during the wet season, the dry season or both. The semi circles on the map show the absolute cultivation area under annual crops during the wet and dry seasons. The area under annual crops nationwide is nearly 1,200,000 ha, of which over 1,100,000 ha was planted during the wet season of 2010 and only about 100,000 ha in the dry season of 2010/11. Roughly 43 percent of all villages in the Lao PDR use more than 95 percent of their agricultural land for annual crops. In Savannakhet, for example, 207,200 ha are used for annual crops during the wet season and 13,200 ha during the dry season.

Map II: As shown on the village-level choropleth map, in 4,858 villages more than 99 percent of all households plant annual crops over two seasons. Only in 125 villages – mainly located on the Bolaven Plateau and in Vientiane Capital – up to 80 percent of all agricultural households grow annual crops over two seasons.

Map III: Meanwhile, perennial crops are grown throughout the Lao PDR, but a few common perennial cash crops (especially rubber and coffee) dominate certain regions of the country. In Champasak, for example, 33,900 ha of perennial crops (mainly coffee) were planted, while 15,900 ha mainly rubber, cardamom and tea are planted in Phongsaly, and 18,500 ha mainly rubber in Luang Namtha.

Most villages reserve only a limited portion of their land for perennial crops. A total of 6,046 villages devote up to 5 percent of their agricultural land to cultivating perennial crops. In contrast, 55 villages, mostly on the Bolaven Plateau and in the north along the Chinese border, use more than 95 percent of their agricultural land for perennial crop cultivation.

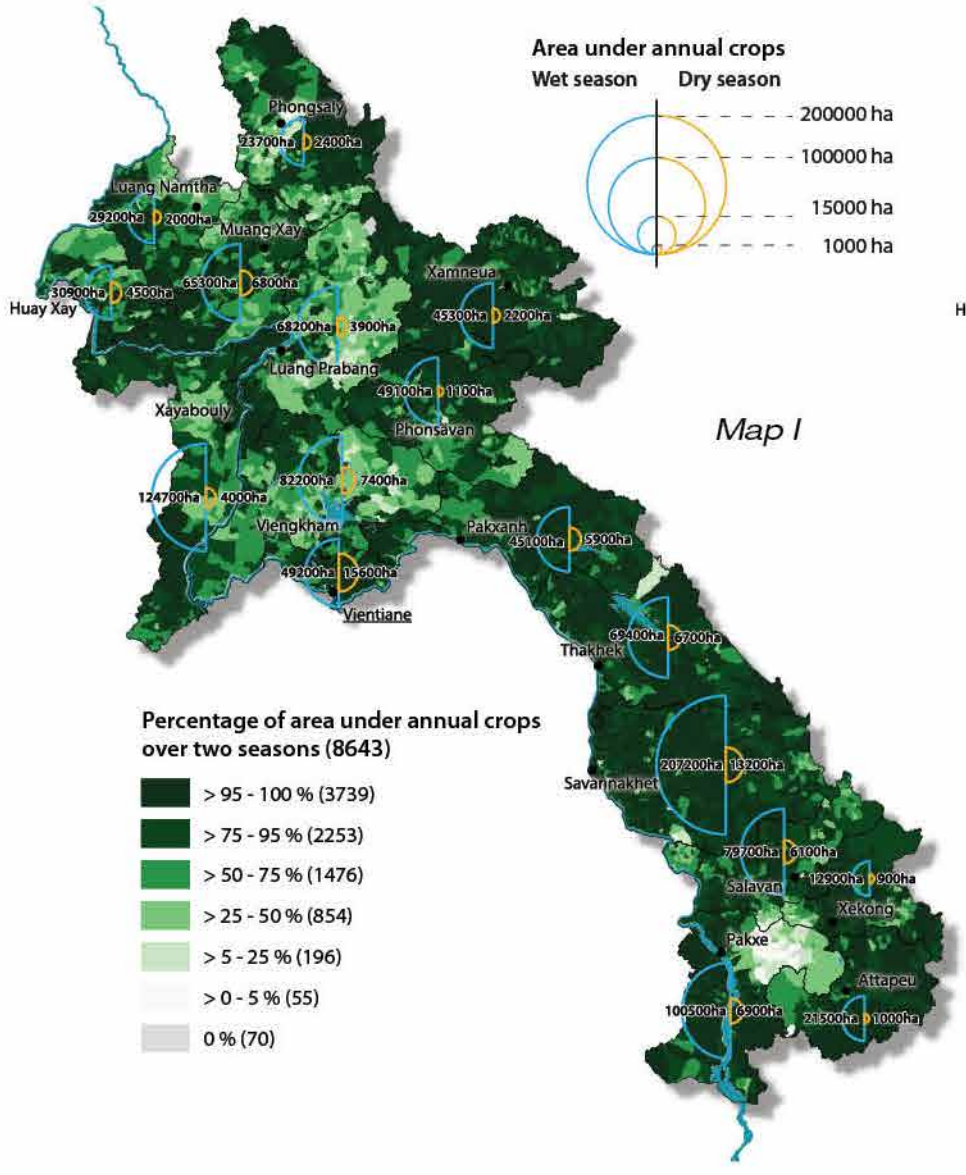
Map IV: Similar patterns are found in terms of the portion of households growing perennial crops. On average, across all provinces about 47 percent of all agricultural households grow perennial crops. In Bolikhamxai, for instance, only 6,400 households cultivate perennial crops, which are only 18 percent of all agricultural households in the province. In Champasak, in contrast, 45,300 households are engaged in perennial crop production, which constitutes 60 percent of all agricultural households in this province.

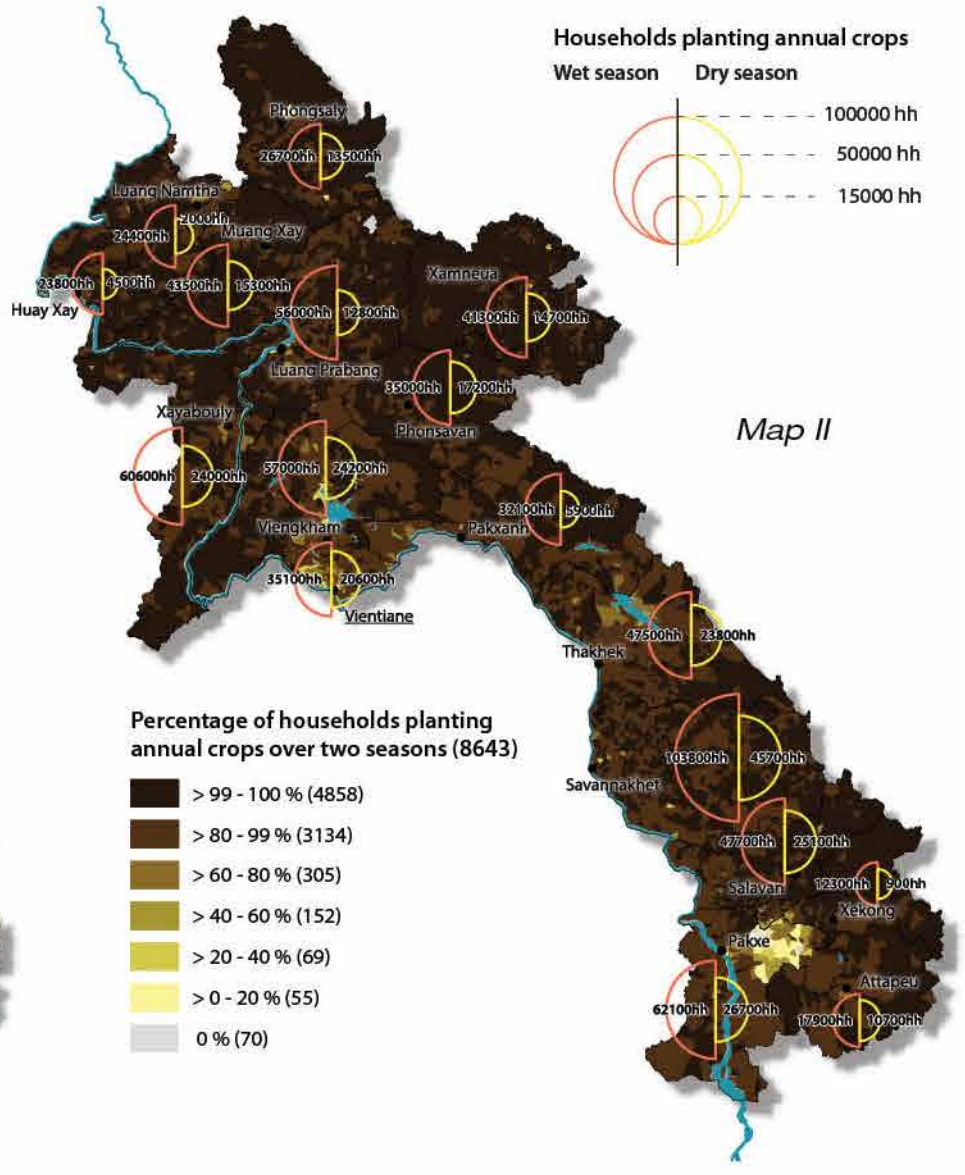
Interpretations

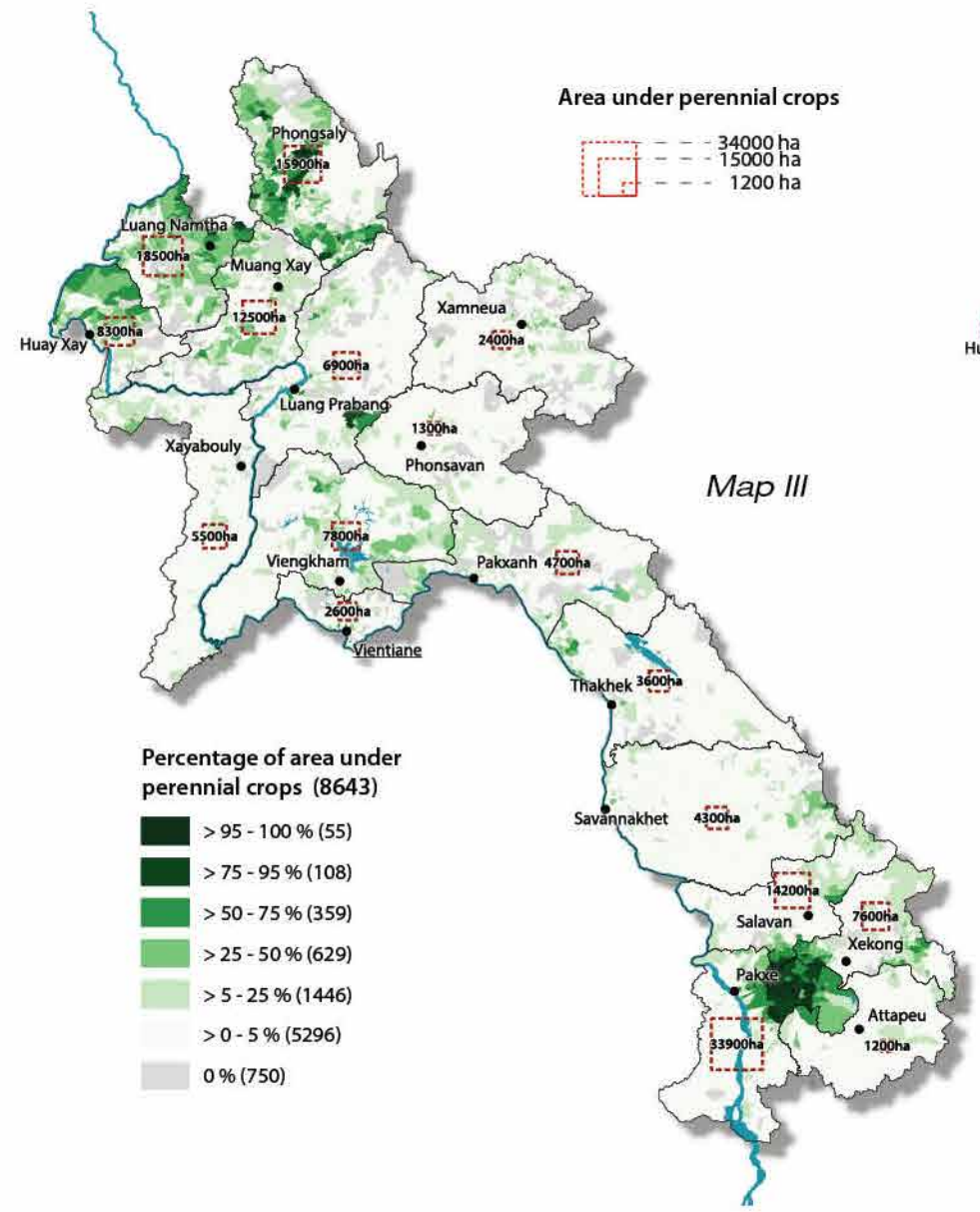
Annual crops in the Lao PDR are generally grown during the wet season on rain-fed fields, but areas with access to irrigation systems can also be under cultivation during the dry season. The majority of annual crops grown are customarily produced on a limited scale, mostly for household consumption but also for sale. In recent years, however, a number of annual crops (e.g. maize and cassava) are produced at larger scales which serve growing market demand.

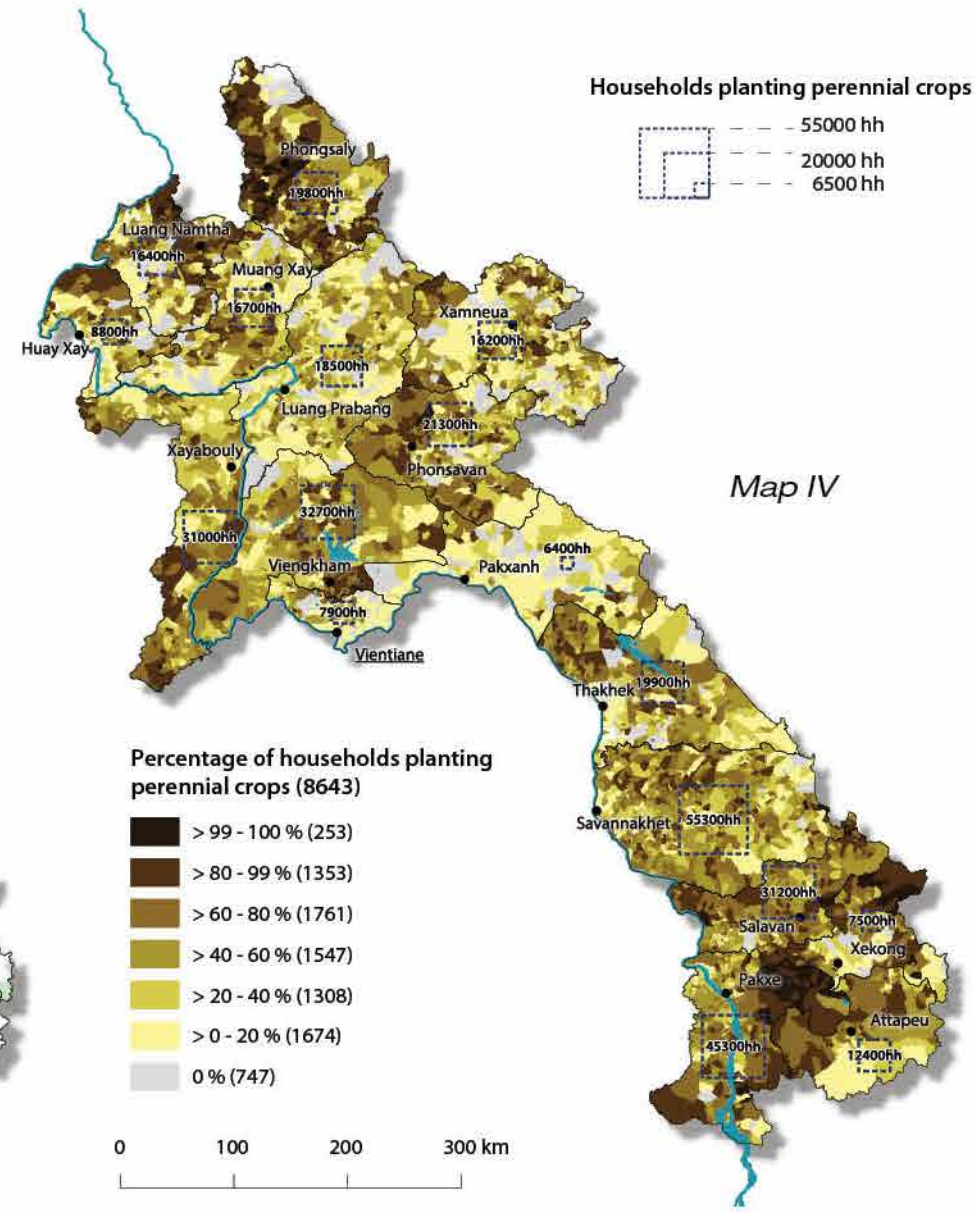
The production of perennial crops in the Lao PDR is often done through large-scale capital investment. As such, these crops are more commonly invested in by wealthy farm households with sufficient land and capital resources as well as by foreign investors (mainly Chinese, Vietnamese and Thai companies). However, this dataset contains only information about Lao agricultural households, thus corporate investments and plantations are not included.

C2 Area and number of households of annual and perennial crops









C3 Diversity of crops

Introduction

The Lao PDR has some of the richest agro-biodiversity resources in the world with well over 100 plant and animal species currently under cultivation and between 1,000 - 2,000 species of plants and animals collected for food and other purposes. The country is endowed with very high biodiversity with 8,000 - 11,000 species of flowering plants and one of the greatest gene pools of glutinous rice varieties in Asia, as well as an unknown number of fungal species. Lao farmers grow various annual and perennial crops in response to growing connections to domestic and global markets. The 2010/11 Agricultural Census indicates a total of over 100 different kinds of annual crops and over 80 different kinds of perennial crops reported under cultivation in the Lao PDR. The main annual crops are rice, fodder crops (mainly maize), sweet corn, cassava, chilli, Job's tear, cabbage, soybean, sesame, cucumber and pumpkin, sugarcane, tobacco, peanut, and watermelon. Key perennial crops planted include mango, rubber, banana, coconut, coffee, tea, tamarind, pineapple, cardamom, plum, mandarin and orange, jackfruit, and jatropha. Figure 3 shows the total area under annual crops (excluding rice) and the total area under perennial crops as well as the share of annual and perennial crops.

Patterns in 2011

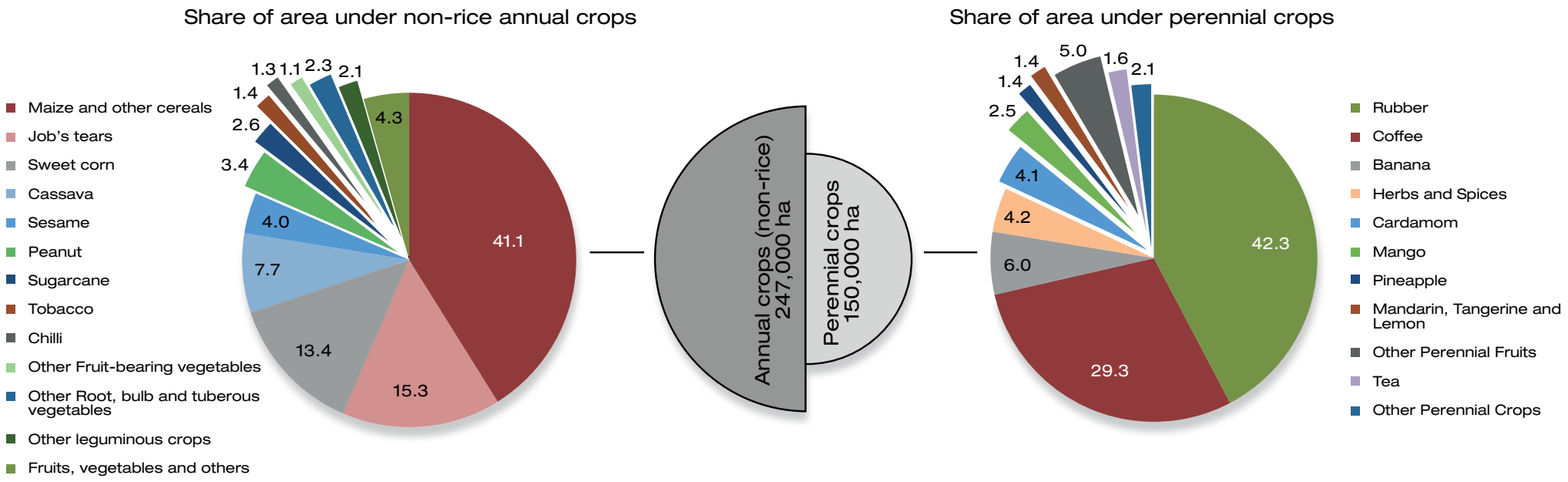
The population of the Lao PDR is made up of a high diversity of ethno-linguistic groups with various livelihoods practices and different farming systems. As displayed in the main map, there are wide variations in crop types (indicated by black dots of varying size) grown in villages across the Lao PDR – the highest being 87 crops grown by a single village. At the lower end, 78 percent of all villages (6,774 villages) grow under 30 crop types but considerable 22 percent of villages (1,869 villages) grow more than 30 crop types. As the village level choropleth map reveals, most households grow up to 5 crop types, but in some villages, households grow up to 25 crop types on average.

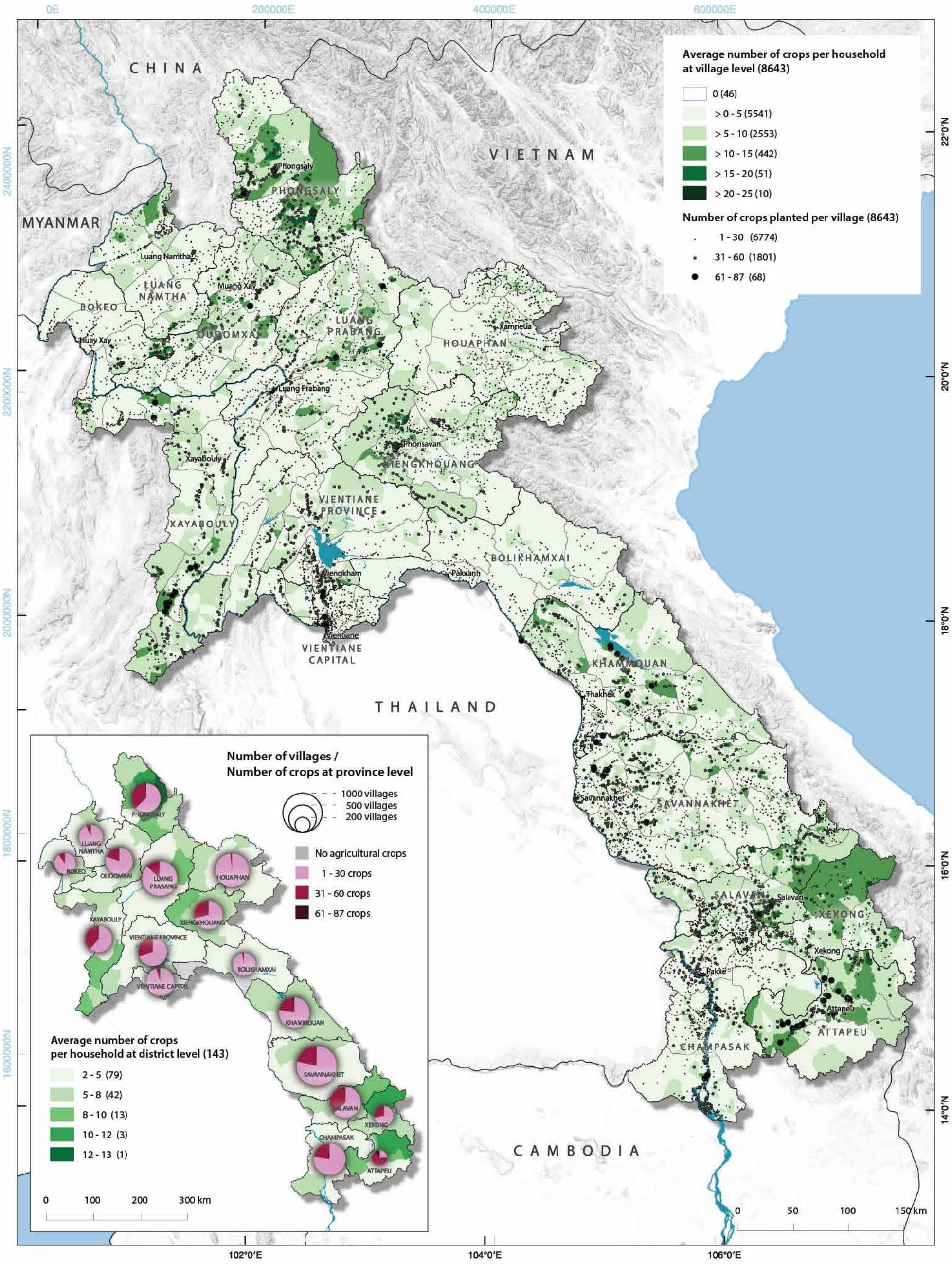
The small inset map shows the average number of crops per household at district level. Areas in the far southeast but also in the far north of the Lao PDR have high agro-biodiversity and cultivate 8 or more crops per household on average. In Attapeu Province, for instance, approximately 20 percent of the 150 villages grow 1 - 30 different crops, 70 percent grow 31 - 60 crops and 10 percent grow 61 - 87 crops. Another example is Houaphan Province, where almost all of the 98 percent of villages in the province grow 1 - 30 crops and the remaining 2 percent grow 31 - 60 different crops on average.

Interpretations

Despite significant economic changes over the last decades, the Lao PDR is still primarily an agrarian society. People in rural areas are still strongly dependent on agro-biodiversity resources for their livelihoods. As described above and illustrated in these maps, the majority of agricultural households still use a large number of crop types in their farming activities to ensure food security, diversify diets and add nutritional value, as well as to increase their income. As such, agro-biodiversity is particularly important to the poor and plays a key role in poverty reduction. However, the trend towards monoculture farming systems for commercial purposes in some regions has caused the decrease in (mostly perennial) crop diversity and boosted the negative, long-term impacts of agriculture on ecosystems and on land and forest resources.

Figure 3: Distribution of main annual and perennial crop types




Average number of crops per household at village level (8643)
0 (46)
> 0 - 5 (5541)
> 5 - 10 (2553)
> 10 - 15 (442)
> 15 - 20 (51)
> 20 - 25 (10)
Number of crops planted per village (8643)
1 - 30 (6774)
31 - 60 (1801)
61 - 87 (68)
CHINA
VIETNAM
MYANMAR
THAILAND
CAMBODIA
PHONGSALY
LUANG NAMTHA
BOKEO
OUDOMXAI
LUANG PRABANG
HOUAPHAN
XAYABOULY
VIENTIANE PROVINCE
VIENTIANE CAPITAL
XIENGKHOUANG
BOLIKHAMXAI
KHAMMOUAN
SAVANNAKHET
SALAVAN
XEKONG
CHAMPASAK
ATTAPEU
Phongsaly
Luang Namtha
Muang Xay
Huay Xay
Luang Prabang
Xamneua
Phonsavan
Xayabouly
Vientiane
Viengkham
Paksanh
Thakhek
Savannakhet
Salavan
Xekong
Pakxe
Attapeu
Number of villages / Number of crops at province level
1000 villages
500 villages
200 villages
No agricultural crops
1 - 30 crops
31 - 60 crops
61 - 87 crops
Average number of crops per household at district level (143)
2 - 5 (79)
5 - 8 (42)
8 - 10 (13)
10 - 12 (3)
12 - 13 (1)
0 100 200 300 km
0 50 100 150 km
0E
200000E
400000E
600000E
2400000N
2200000N
2000000N
1800000N
1600000N
22°0'N
20°0'N
18°0'N
16°0'N
14°0'N
102°0'E
104°0'E
106°0'E

C4 Upland rice in wet season

Introduction

Upland rice is the main crop grown in the northern uplands and along the Vietnam border, whereas relatively small areas are cultivated in central and southern Lao PDR. Upland rice is grown as a rain-fed crop on sloping land and is usually only grown during the wet season. Farmers normally grow upland rice for subsistence. Upland rice is traditionally planted under shifting cultivation or rotational cultivation and can be intercropped with a variety of crops for both family consumption and for market.

Upland rice is grown under shifting cultivation, often in rotational cultivation patterns which involve cutting and burning vegetation, planting rice seeds, weeding and finally harvesting (use of the plot for one year: "*hai lao*" or use of the plot for two years in a row: first year "*hai lao*" and second year "*hai lock*") followed by a fallow period whose length depends on the regeneration capacity of the biomass, on soil fertility and also on land availability in the region. For the customary annual production of upland rice, land preparation occurs between January and April, planting between mid-April and May, weeding between June and August, and harvesting in September or October, depending on the maturation time of the upland rice variety. Weeding is one of the most difficult and labour intensive tasks involved in upland rice production. It is done usually by women and children three to five times per crop depending on the length of the previous fallow (Linquist *et al.*, 2006).

Patterns in 2011

The total area under upland rice in the Lao PDR is approximately 210,000 ha. There are, however, serious methodological problems to quantifying the exact extent of shifting cultivation (Messerli *et al.*, 2009). Considering that upland rice is grown in rotational cultivation systems which include fallow areas, this total area could be eight to nine times higher than measured here (depending on the fallow length).

The main map illustrates which districts have the highest absolute areas of upland rice: Pha-oudom District (5,600 ha) in Bokeo Province, Xai (4,700 ha) in Oudomxai, and Nambak (4,600 ha) in Luang Prabang Province. Less upland rice is grown outside of these mountainous regions, such as around Vientiane Capital and along the Mekong River to the south.

The main map shows the proportion of agricultural land under upland rice at the village level. In 2011, 4,326 villages or half of all villages in the Lao PDR cultivated upland rice. Especially around Pha-oudom District, many villages devote more than 75 percent of their agricultural land to upland rice.

240,000 households grow upland rice, which constitutes 30 percent of all 781,600 agricultural households countrywide. Oudomxai has the most households farming upland rice, with 25,507 households, whereas Vientiane Capital, the most urbanized area in the Lao PDR, has only 767 agricultural households farming upland rice.

The district level inset map depicts the average area of upland rice per producing household. In two districts in Vientiane Capital and in Xaibouly District in Savannakhet, households have no upland rice. In contrast, seven districts have a mean area over 1.0 ha per producing household, all of which are located in northwestern Lao PDR, including Pha-oudom District in Bokeo, which also has the largest total area under upland rice with 5,600 ha. The districts with small mean areas of upland rice per planting household are predominantly located in the lowlands from Vientiane Capital along the Mekong River, down to the south.

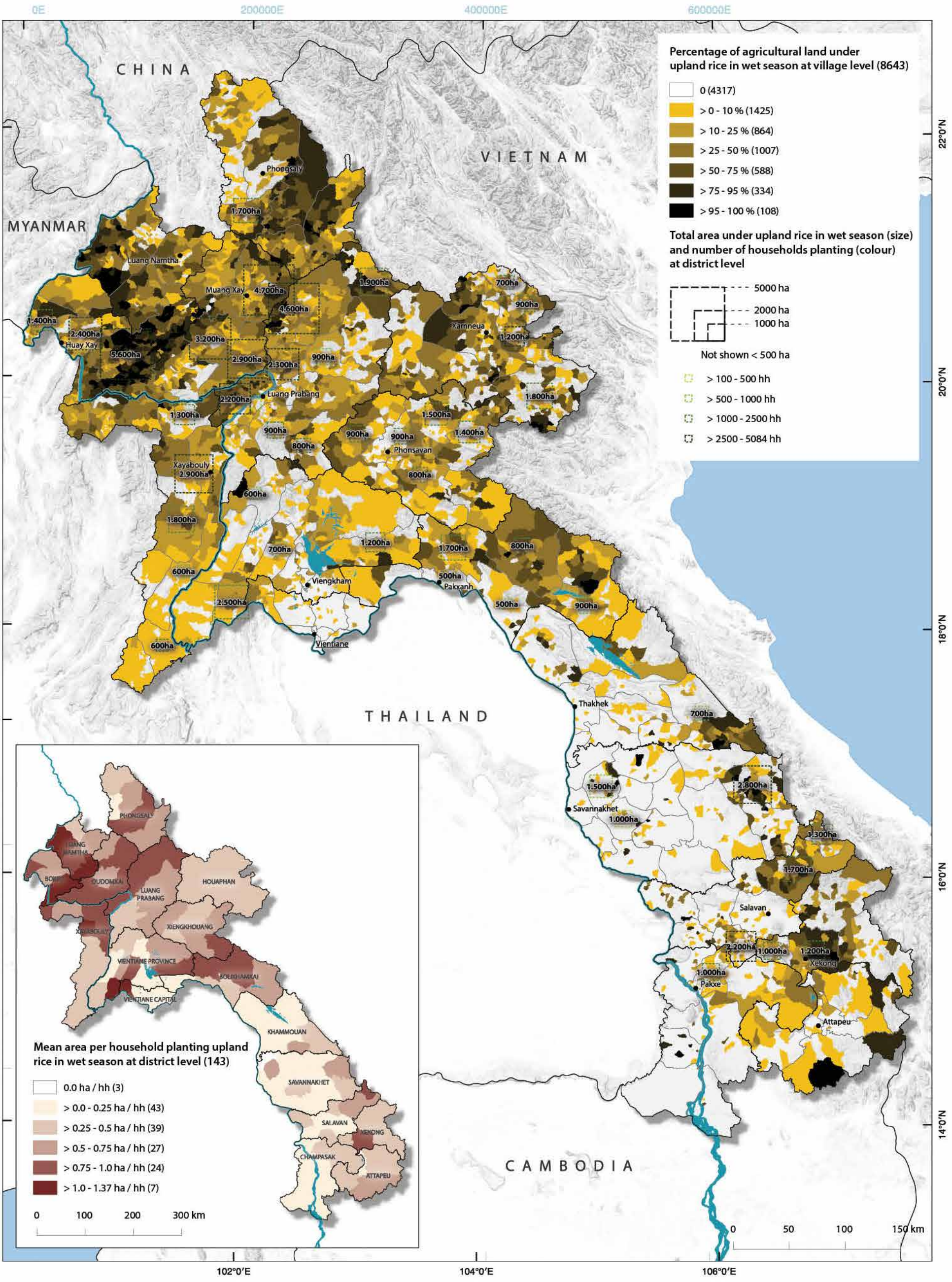
Interpretations

The dominance of upland rice in the north is due to the fact that this region's topography is primarily hilly and mountainous with few plains suitable for paddy rice cultivation and low potential for irrigation development. Conversely, due to the advantage of having more flat land suitable for rain-fed and irrigated rice cultivation in the central and southern regions, a low recorded proportion of agricultural land is used for upland rice there.

The absolute area under upland rice cultivation increased slightly across the Lao PDR from 199,197 ha in 1999 to 212,009 ha in 2011. However, the number of upland rice growing households has decreased from 260,000 to 240,000.

Finally, the accuracy of these numbers measuring cultivation of upland rice may be affected by the fact that, after decades of state efforts to discourage upland rice cultivation through shifting cultivation systems, it is a sensitive topic to interview households about. In the 1990s, the GoL with support from development partners started a range of shifting cultivation eradication programs. Shifting cultivation was considered an antiquated form of agricultural production and an obstacle to the country's development. In many areas, upland rice areas were replaced by cash crops such as maize, rubber, Job's tears, banana, or cassava plantations in many northern provinces. A three-plot rotational cultivation system was also introduced, but because this system shortened fallow periods, it led to an increase in soil degradation, erosion, and the occurrence of weeds and pests. Today the term "eradication" has been replaced by "stabilization" to reflect a shift in government approach. However, food security especially in the upland areas is still one of the Government key policies especially in upland areas, and due to a lack of alternatives, rotational cultivation is tolerated. Today, the government's focus is more on the improvement of upland rice cropping systems that are environmentally sustainable and suitable for upland environments.

C4 Upland rice in wet season



C5 Lowland rice in wet season

Introduction

Wet season lowland rice, also called rain-fed lowland rice, is grown in bunded, flooded paddy fields, mainly in the flat regions of the country in the Mekong River Valley but also in other valleys, depressions and flat areas throughout the upland regions. Lowland rice cultivation generally commences at the beginning of the wet season, with land preparation consisting of two stages: first ploughing and then puddling or harrowing. Land preparation is mostly done using two-wheel handheld tractors (*toktoks*), which have largely replaced buffaloes in many places. Rice seeds are sown in a nursery seedbed, and then young seedlings are pulled out and transplanted in the main fields, though transplanting may be deferred if the onset of rainfall is delayed. The harvesting period is normally between October and November, depending on the maturation period of the varieties planted. Paddy fields in areas with access to irrigation systems are also supplemented with irrigation water during dry periods of the wet season. After harvest, during the dry season, paddy fields in non-irrigated areas are left unplanted and are grazed by livestock, whereas fields are planted with rice or other crops (such as tobacco) in areas with irrigation.

Patterns in 2011

The total area under wet season lowland rice is approximately 735,000 ha and, as the main map shows, and a large proportion is grown in the lowlands of central and southern Lao PDR. The green squares indicate the area under wet season lowland rice per district, the highest being 26,400 ha in Champhon District, Savannakhet Province, where almost one quarter of the entire area of that district is under rain-fed paddy rice (106,500 ha in that district alone). Savannakhet Province is known for its extensive contribution to rice production in the Lao PDR, with almost 200,000 ha under wet rice production (27 percent of the total wet season lowland rice area). The districts in other provinces surrounding Savannakhet also have large areas under wet season lowland rice, with the exceptions of those in Pakxong District on the Bolaven Plateau in Champasak (where coffee production dominates) and the very hilly eastern region, especially in Xekong.

There is a range in the proportion of all households cultivating wet season lowland rice across different areas of the country. In Champhon District in Savannakhet Province, for example, more than 10,000 households farm wet season lowland rice. In total, 569,756 households or 70 percent of all agricultural households grow wet season lowland rice. Savannakhet's 98,635 households represent 17 percent of all households in the Lao PDR cultivating wet season lowland rice.

Meanwhile, 430 villages or 5 percent nationally do not cultivate any lowland rice. These are mainly located in the northern regions where, because of steep slopes, there is not much space appropriate for establishing rice paddies, or in the centre of Vientiane Capital, the most urban area in the Lao PDR where less agriculture is done generally. All other villages (95 percent nationally) plant at least some lowland rice in the wet season, and about half of them devote more than 50 percent of their agricultural land to wet season lowland rice.

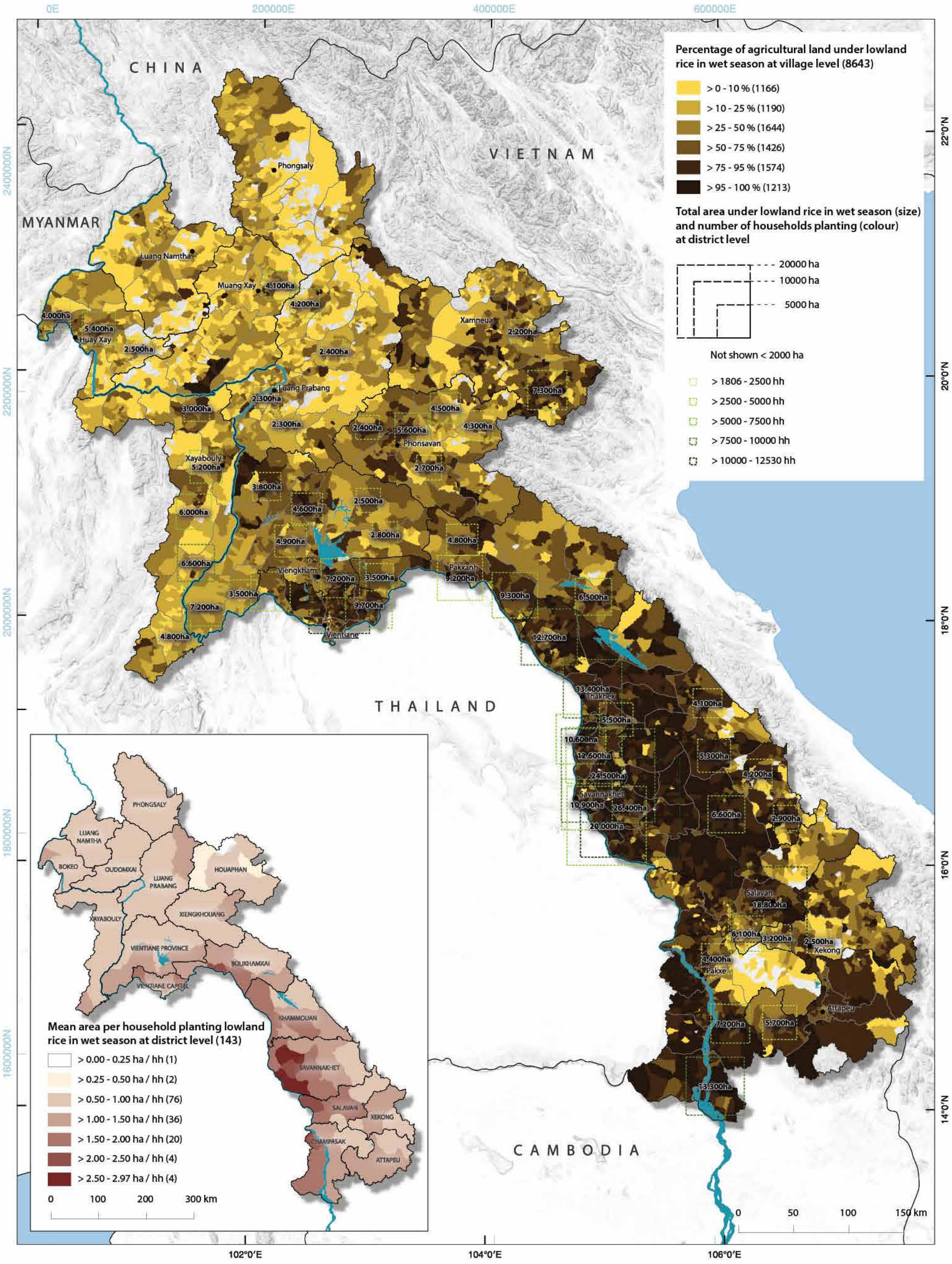
The district level inset map shows the average area of wet season lowland rice per producing household. 8 districts have a higher average of 2.0 ha per household, all of them located alongside the Mekong River Valley in central and southern Lao PDR. In the mountainous regions of the country the average area is considerably lower.

Interpretations

The dominance of wet season lowland rice in the central and southern regions is largely due to the topography of the land. Many large plains along the Mekong River Corridor suitable for lowland rice cultivation are concentrated in these regions. Conversely, the northern provinces are occupied mostly by steep uplands which lack flat areas suitable for rice paddy establishment. Moreover, many farmers in lowland areas of the northern regions prefer planting other cash crops that render higher economic returns to lowland rice. Amongst those products are watermelon, green beans, chilli and various kinds of vegetables.

Ensuring national food security and the commercialization of rice by boosting rice production in lowland areas, especially during the wet season, is part of the GoL's prioritized agenda (MAF, 2015). Some of the development programs aimed at supporting the GoL's agenda focus on rice promotion and extension in the lowland regions. These programs include the construction of large irrigation schemes since the 1990s, and improving rice varieties for higher tolerance to drought and floods and for faster growth.

C5 Lowland rice in wet season



C6 Lowland rice in dry season

Introduction

In areas with irrigation systems, commonly in the lowland regions, farmers are able to grow rice also during the dry season. Still, more management is required for dry season than wet season lowland rice, as a higher degree of management of irrigation water, use of fertilizers, and control of insects and weeds is expended during the dry season (Linquist *et al.*, 2006).

The cropping cycle and management practices for irrigated lowland rice are generally similar to that of rain-fed lowland rice, both of which are grown in bunded, flooded paddy fields. After harvesting the wet season crop, rice fields are irrigated and land preparation starts. The nursery seedbed is sown in December and the seedlings are transplanted to other areas by early January. Harvesting takes place in April or May, depending on the type and maturing time of different varieties.

Patterns in 2011

There is far less lowland rice cultivated during the dry season than during the wet season, due primarily to a lack of irrigation facilities. In 2011, the total area of irrigated dry season lowland rice in the Lao PDR was 52,500 ha, which represents only 7 percent of the total lowland rice cultivation area. As with wet season lowland rice, dry season lowland rice cultivation areas are mainly concentrated in the Mekong River Valley, where the Mekong River and its tributaries supply water to irrigation systems.

As can be seen on the main map, most of the irrigated dry season rice cultivation areas are located in Vientiane Capital, in neighbouring districts of Vientiane Province, and also in some regions close to the Mekong River. The districts south of Thakhek in Khammouan Province also stand out as areas of extensive production, namely Nongbok (2,000 ha, 2,277 households) and Xaybouly (2,900 ha, 3,800 households). The southernmost district in the Lao PDR, Khong District, has 1,700 ha under irrigated dry season lowland rice cultivation, while Salavan District, located at the Xe Don River, has 2,000 ha, and the region around Attapeu town, located on the Xe Kong River, also have significant irrigated dry season lowland rice areas. Champhon District in Savannakhet, with 4,100 ha, has the largest area in the country of both irrigated dry season lowland rice and of wet season lowland rice. These areas in Champhon have an existing paddy infrastructure used during the wet season and include the Xe Champhon wetlands, which are the second largest wetlands in the Lao PDR and constitute a major water source for irrigation in this region.

In total, 5,534 villages or 64 percent of all villages in the Lao PDR do not grow any irrigated lowland rice in the dry season. 2,052 villages only use up to 10 percent of their agricultural land for irrigated lowland rice. These villages are scattered across the country with exceptions in Xiengkhouang, western Houaphan, eastern Luang Prabang, Phongsaly and eastern Savannakhet.

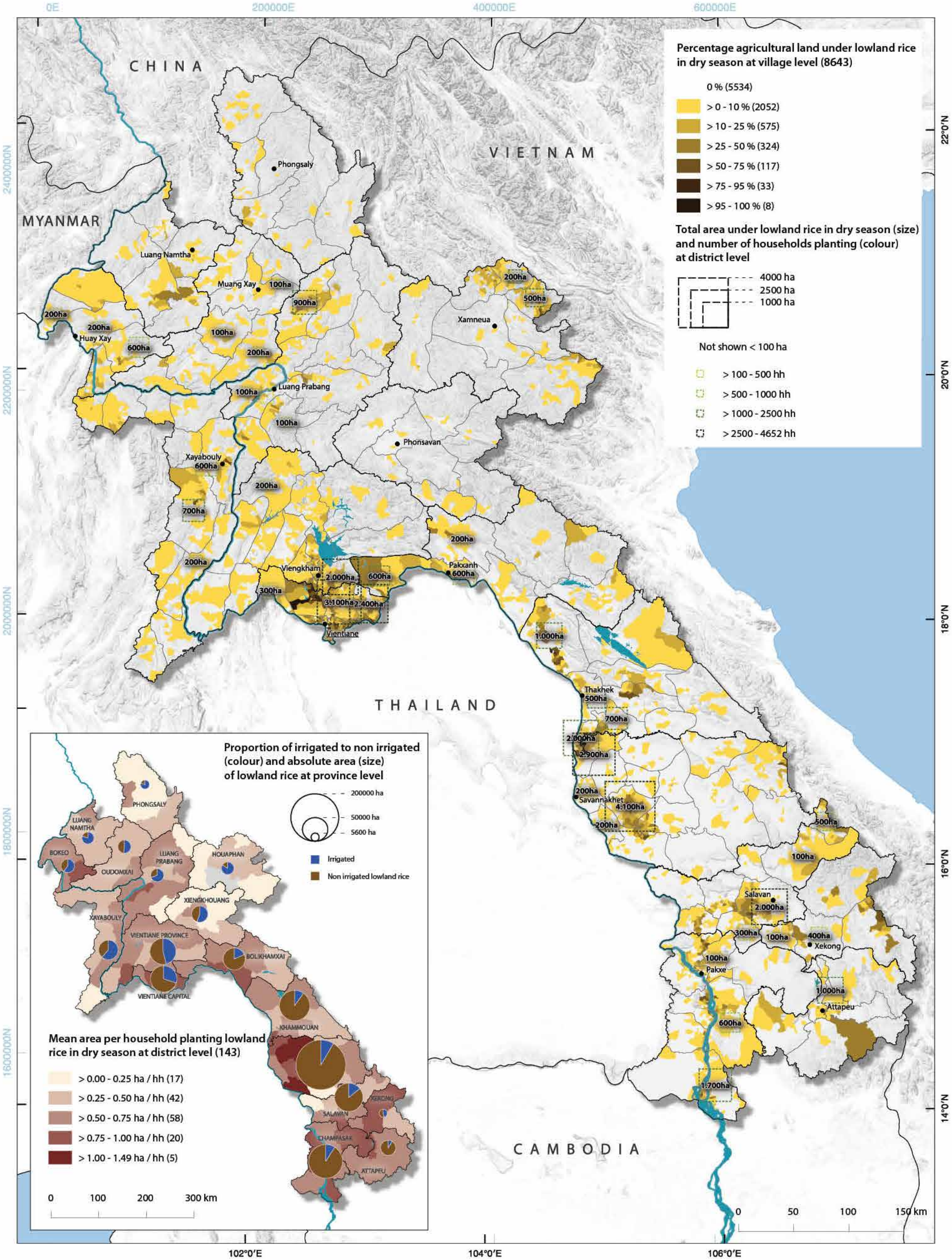
The small map shows the mean area of irrigated lowland rice planted per producing household in dry season at the district level. The national average is 0.6 ha per household but some districts in western Savannakhet, Vientiane Capital and Champasak have higher averages. In Xiengkhouang and Houaphan, the mean per household is under 0.25 ha.

Additionally, the small inset map shows how much of the total planted lowland rice (over two seasons) is irrigated and not irrigated. In Savannakhet, for example, more than 200,000 ha of lowland rice are grown, of which under 10 percent are irrigated, while in Houaphan only 13,500 ha are grown but more than 80 percent are irrigated.

Interpretations

Although the GoL has invested extensive resources into the development of irrigation facilities since 1996, many areas still lack access to irrigation. The low efficiency of many pumping stations (which often use old technology and operate at high energy consumption) coupled with insufficient maintenance of existing irrigation facilities, especially main and secondary canals, has led to an increase in rice production costs and consequently many irrigation schemes were abandoned and unused.

Further investment in new construction and the rehabilitation of damaged or outdated irrigation facilities should be done in parallel with appropriate operations and maintenance of existing irrigation systems. Subsidizing operation costs such as electricity and water fees is on the GoL's agenda as a way to ensure national food security and the commercialization of rice production (MAF, 2015). Apart from large-scale irrigation schemes, the GoL has recently promoted gravity-fed small scale irrigation systems as well as tapping into village groundwater sources to both reduce production costs and increase rice production in the dry season.


Percentage agricultural land under lowland rice in dry season at village level (8643)
0 % (5534)
> 0 - 10 % (2052)
> 10 - 25 % (575)
> 25 - 50 % (324)
> 50 - 75 % (117)
> 75 - 95 % (33)
> 95 - 100 % (8)
Total area under lowland rice in dry season (size) and number of households planting (colour) at district level
4000 ha
2500 ha
1000 ha
Not shown < 100 ha
> 100 - 500 hh
> 500 - 1000 hh
> 1000 - 2500 hh
> 2500 - 4652 hh
CHINA
VIETNAM
MYANMAR
THAILAND
CAMBODIA
Phongsaly
Luang Namtha
Muang Xay
Huay Xay
Luang Prabang
Xamneua
Phonsavan
Xayabouly
Viengkham
Vientiane
Pakxanh
Thakhek
Savannakhet
Salavan
Xekong
Pakxe
Attapeu
0E
200000E
400000E
600000E
2400000N
2200000N
2000000N
1800000N
1600000N
22°0'N
20°0'N
18°0'N
16°0'N
14°0'N
102°0'E
104°0'E
106°0'E
0 50 100 150 km
Proportion of irrigated to non irrigated (colour) and absolute area (size) of lowland rice at province level
200000 ha
50000 ha
5600 ha
Irrigated
Non irrigated lowland rice
PHONGSALY
LUANG NAMTHA
BOKEO
OUDOMXAI
LUANG PRABANG
HOUAPHAN
XIENGKHOUANG
XAYABOULY
VIENTIANE PROVINCE
VIENTIANE CAPITAL
BOLIKHAMXAI
KHAMMOUAN
SALAVAN
CHAMPASAK
ATTAPEU
Mean area per household planting lowland rice in dry season at district level (143)
> 0.00 - 0.25 ha / hh (17)
> 0.25 - 0.50 ha / hh (42)
> 0.50 - 0.75 ha / hh (58)
> 0.75 - 1.00 ha / hh (20)
> 1.00 - 1.49 ha / hh (5)
0 100 200 300 km

C7 Development of rice areas

Introduction

Rice is the most essential food crop planted in the Lao PDR and rice production is the main farming activity, accounting for more than 63 percent of the total area under cultivation throughout the country. Rice in the Lao PDR is grown under three main agro-ecosystems, namely, rain-fed lowlands (wet season lowland rice), irrigated lowlands (dry season lowland rice), and rain-fed uplands (wet season upland rice). Rain-fed lowland rice is grown in bunded fields flooded for at least part of the season and water comes from natural rainfall. Irrigated lowland rice is grown in bunded fields flooded for at least part of the season and irrigated water is used. Rain-fed upland rice is grown in unbunded fields on sloping land under shifting cultivation systems and depends on rainfall (Linquist *et al.*, 2006).

Patterns in 2011

The total rice cultivation area throughout the Lao PDR is nearly one million ha. Wet season lowland rice dominates rice cultivation and accounts for 72 percent (735,000 ha) of the total area under rice production, whereas dry season lowland rice and wet season upland rice constitute only 6 percent (52,500 ha) and 17 percent (210,000 ha, without counting fallow areas - see C4) of the total area under rice production respectively. Wet season lowland rice dominates mainly in the lowlands in the central and southern provinces, but also in flat areas, mainly in valleys alongside rivers, or where rice terraces have been established on slopes in the mountainous northern and very eastern parts of the Lao PDR along the Vietnam border. Savannakhet and Champasak cover around 30 percent of the total wet season lowland rice cultivation area. Wet season upland rice cultivation occurs more in the mountainous northern and very eastern parts of the country. Irrigated dry season lowland rice is mainly grown in Vientiane Capital and along the Mekong River in the central and southern provinces. Figure 4 shows the total area of upland rice, lowland rice in wet season and lowland rice in dry season per province.

Changes between 1999 and 2011

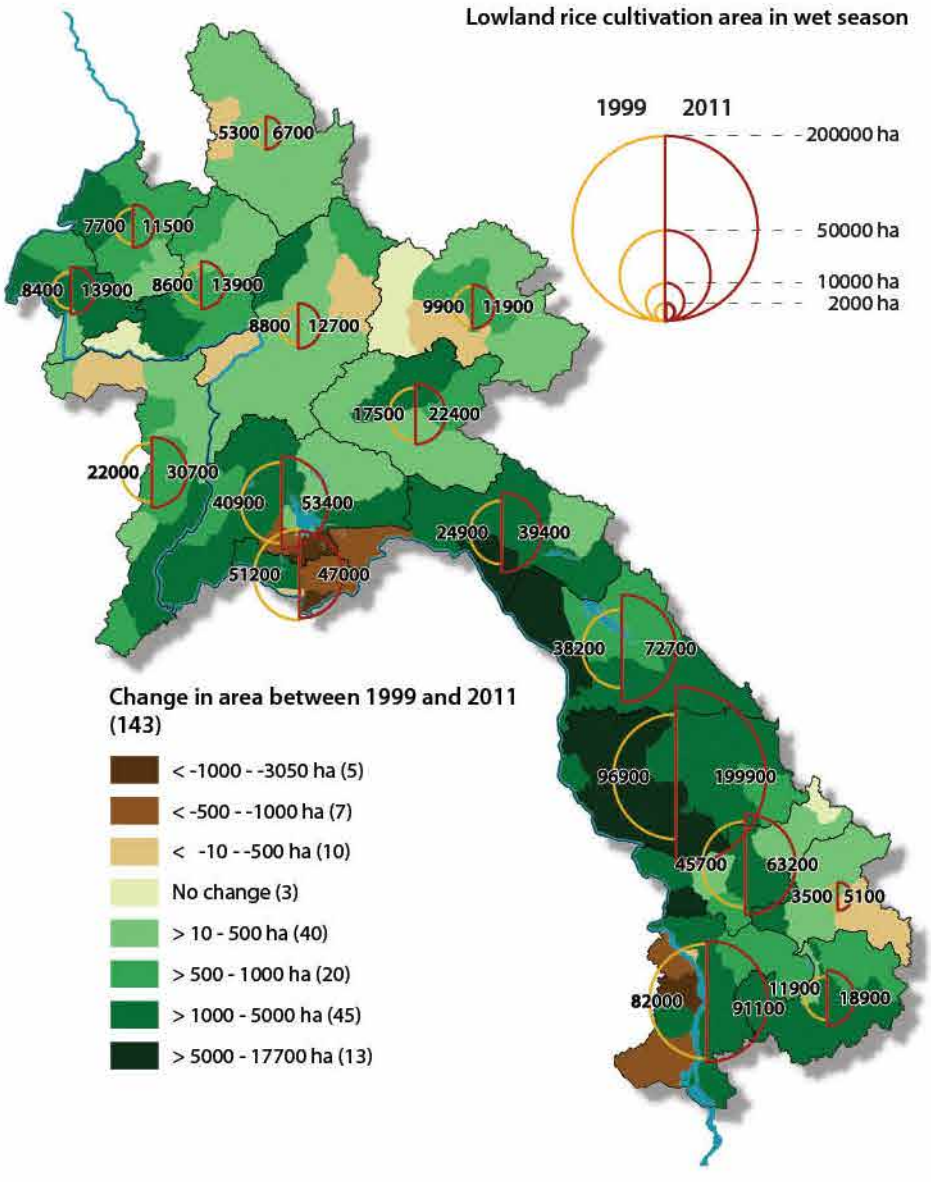
In the Lao PDR, between 1999 and 2011, the total rice cultivation area increased by over 200,000 ha from 738,187 ha to 997,500 ha – an increase of 35 percent. In terms of the contribution of each rice agro-ecosystem to the total rice area, during 1999 and 2011, wet season lowland rice continued to be the dominant form of rice production and accounted for by far the largest area (72 percent of total rice area in 2011), which was an increase from 65 percent in 1999. The share of dry season lowland rice area dropped slightly from 8 percent in 1999 to 6 percent in 2011. The contribution of wet season upland rice to total rice area decreased from 27 percent in 1999 to 22 percent in 2011.

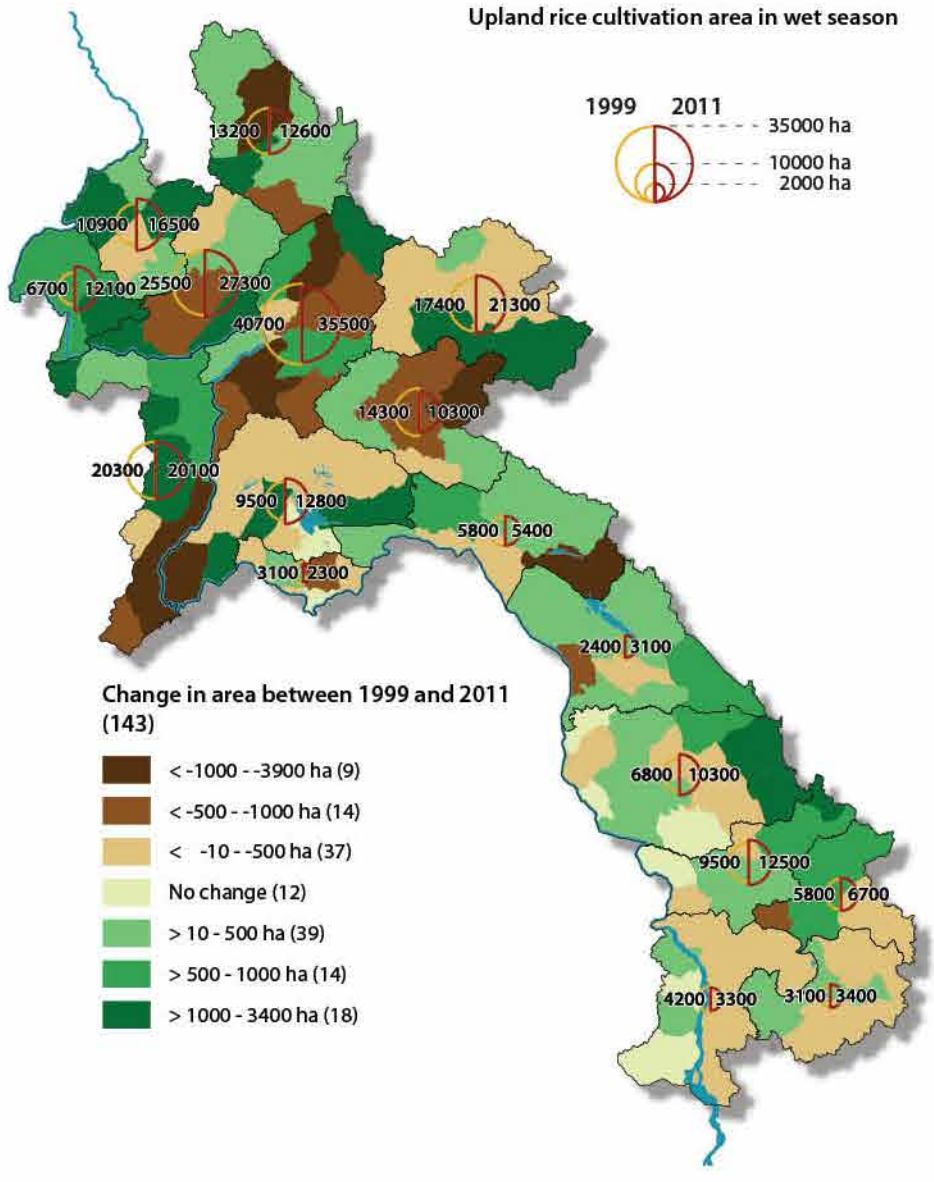
The provinces with the largest total area under rice cultivation in both 1999 and 2011 were Savannakhet and Champasak Provinces. However, over the intervening decade, the largest increase in total rice area occurred in Savannakhet Province which experienced an increase of 107,000 ha (94 percent or nearly double). Next are Khammouan and Salavan Provinces with a total increase of 37,082 ha (83 percent) and 22,043 ha (37 percent) respectively. Champasak Province experienced a moderate increase of 6,887 ha (15 percent). Nonetheless, Vientiane Capital and Luang Prabang recorded a decline in the total area under rice production of 7,279 ha (11 percent) and 1,045 ha (2 percent) respectively. At district level, about 75 percent of all 143 districts increased the total rice area.

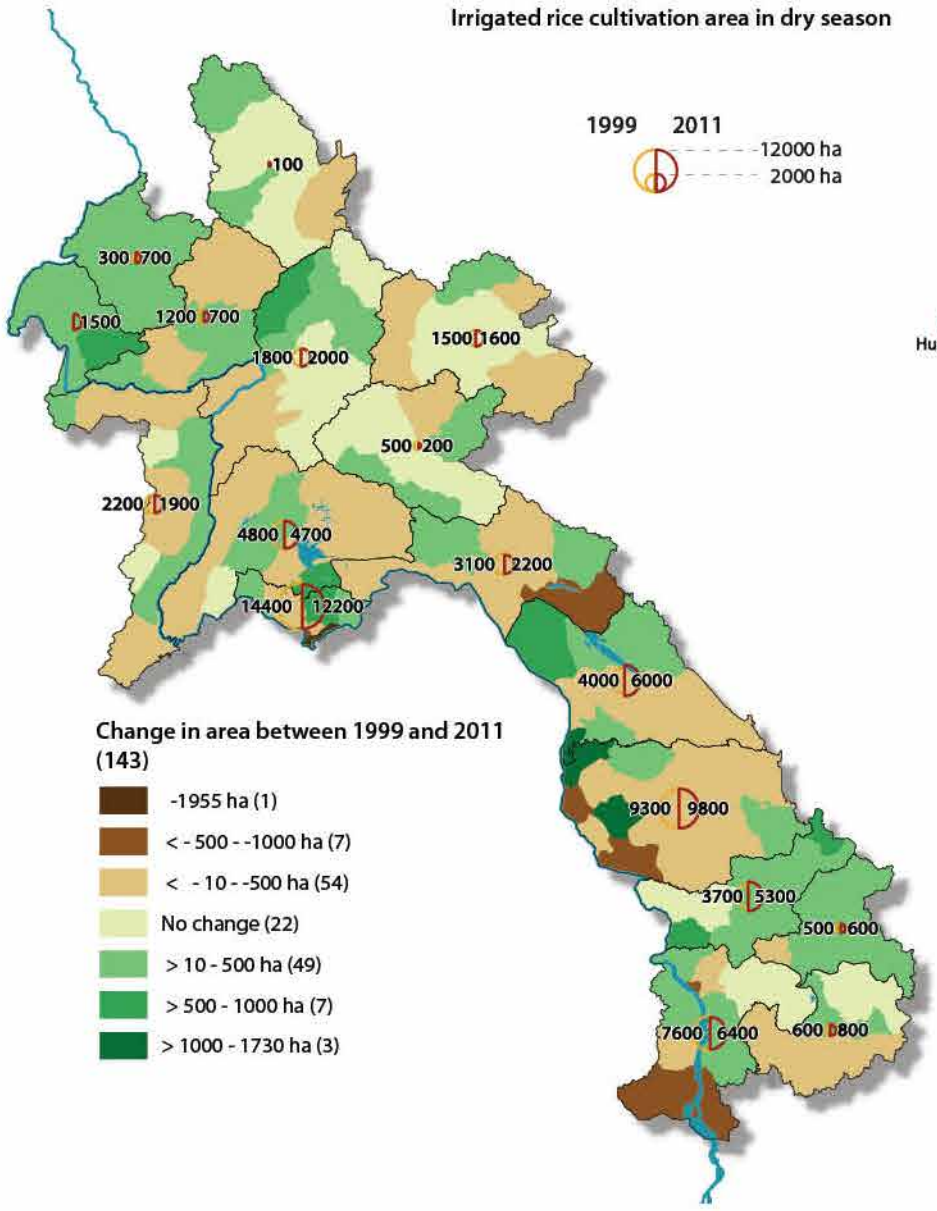
The wet season lowland rice area in the Lao PDR increased by almost 50 percent, from 483,360 ha in 1999 to 714,353 ha in 2011. As the top left map demonstrates, the area under wet season lowland rice cultivation increased especially in the western part of the central region. Almost all districts starting from Pakkading District in Bolikhamxai down to Khongxedon in Salavan saw increases in the area under wet season lowland rice. In the areas in and around Vientiane Capital and in western Champasak Province, the area under wet season lowland rice decreased.

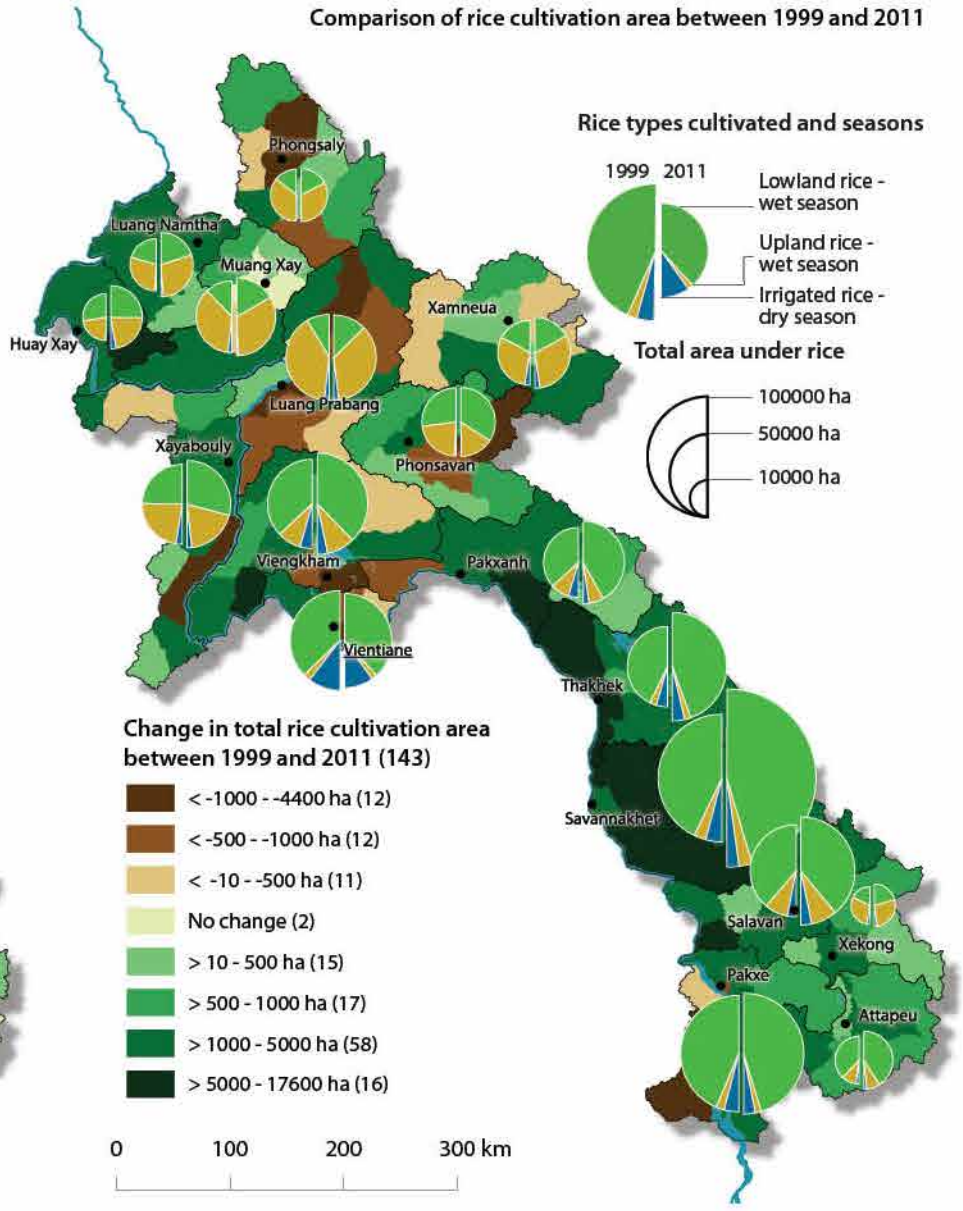
Unlike in the wet season, the dry season irrigated lowland rice area throughout the Lao PDR stayed more or less unchanged with 55,630 ha in 1999 and 56,769 ha in 2011. As the bottom left map depicts, the changes in most regions were marginal. Hadxayfong District in Vientiane Capital experienced the most significant decrease. Almost 2,000 ha of irrigated paddy land was lost here due to rises in the urban population and the resulting expansion of urban development. Champhon District in Savannakhet with its large wetland areas experienced the most significant increase in irrigated paddy area.

The wet season upland rice area increased slightly from 199,197 ha in 1999 to 212,009 ha in 2011. As can be seen in the top right map, in general, changes are very scattered across all districts in the country. Most striking are the southern districts in Xayabouly where the upland rice cultivation area declined a few hundred ha, and by contrast, the northern parts of Xayabouly increased their total upland rice area some hundred ha. In sum, the total national upland rice area stayed in absolute numbers stable.


Lowland rice cultivation area in wet season
1999 2011
200000 ha
50000 ha
10000 ha
2000 ha
5300 6700
7700 11500
8400 13900
8600 13900
8800 12700
9900 11900
17500 22400
22000 30700
40900 53400
51200 47000
24900 39400
38200 72700
96900 199900
45700 63200
3500 5100
82000 91100 11900 18900
Change in area between 1999 and 2011 (143)
< -1000 - -3050 ha (5)
< -500 - -1000 ha (7)
< -10 - -500 ha (10)
No change (3)
> 10 - 500 ha (40)
> 500 - 1000 ha (20)
> 1000 - 5000 ha (45)
> 5000 - 17700 ha (13)


Upland rice cultivation area in wet season
1999 2011
35000 ha
10000 ha
2000 ha
13200 12600
10900 16500
6700 12100 25500 27300
40700 35500
17400 21300
14300 10300
20300 20100
9500 12800
5800 5400
3100 2300
2400 3100
6800 10300
9500 12500
5800 6700
4200 3300
3100 3400
Change in area between 1999 and 2011 (143)
< -1000 - -3900 ha (9)
< -500 - -1000 ha (14)
< -10 - -500 ha (37)
No change (12)
> 10 - 500 ha (39)
> 500 - 1000 ha (14)
> 1000 - 3400 ha (18)


Irrigated rice cultivation area in dry season
1999 2011
12000 ha
2000 ha
100
300 700
1500
1200 700
1800 2000
1500 1600
500 200
2200 1900
4800 4700
14400 12200
3100 2200
4000 6000
9300 9800
3700 5300
500 600
7600 6400
600 800
Change in area between 1999 and 2011 (143)
-1955 ha (1)
< - 500 - -1000 ha (7)
< - 10 - -500 ha (54)
No change (22)
> 10 - 500 ha (49)
> 500 - 1000 ha (7)
> 1000 - 1730 ha (3)


Comparison of rice cultivation area between 1999 and 2011
Rice types cultivated and seasons
1999 2011
Lowland rice - wet season
Upland rice - wet season
Irrigated rice - dry season
Total area under rice
100000 ha
50000 ha
10000 ha
Phongsaly
Luang Namtha
Muang Xay
Xamneua
Huay Xay
Luang Prabang
Xayabouly
Phonsavan
Vientiane
Viengkham
Pakxanh
Thakhek
Savannakhet
Salavan
Xekong
Pakxe
Attapeu
Change in total rice cultivation area between 1999 and 2011 (143)
< -1000 - -4400 ha (12)
< -500 - -1000 ha (12)
< -10 - -500 ha (11)
No change (2)
> 10 - 500 ha (15)
> 500 - 1000 ha (17)
> 1000 - 5000 ha (58)
> 5000 - 17600 ha (16)
0 100 200 300 km

Interpretations

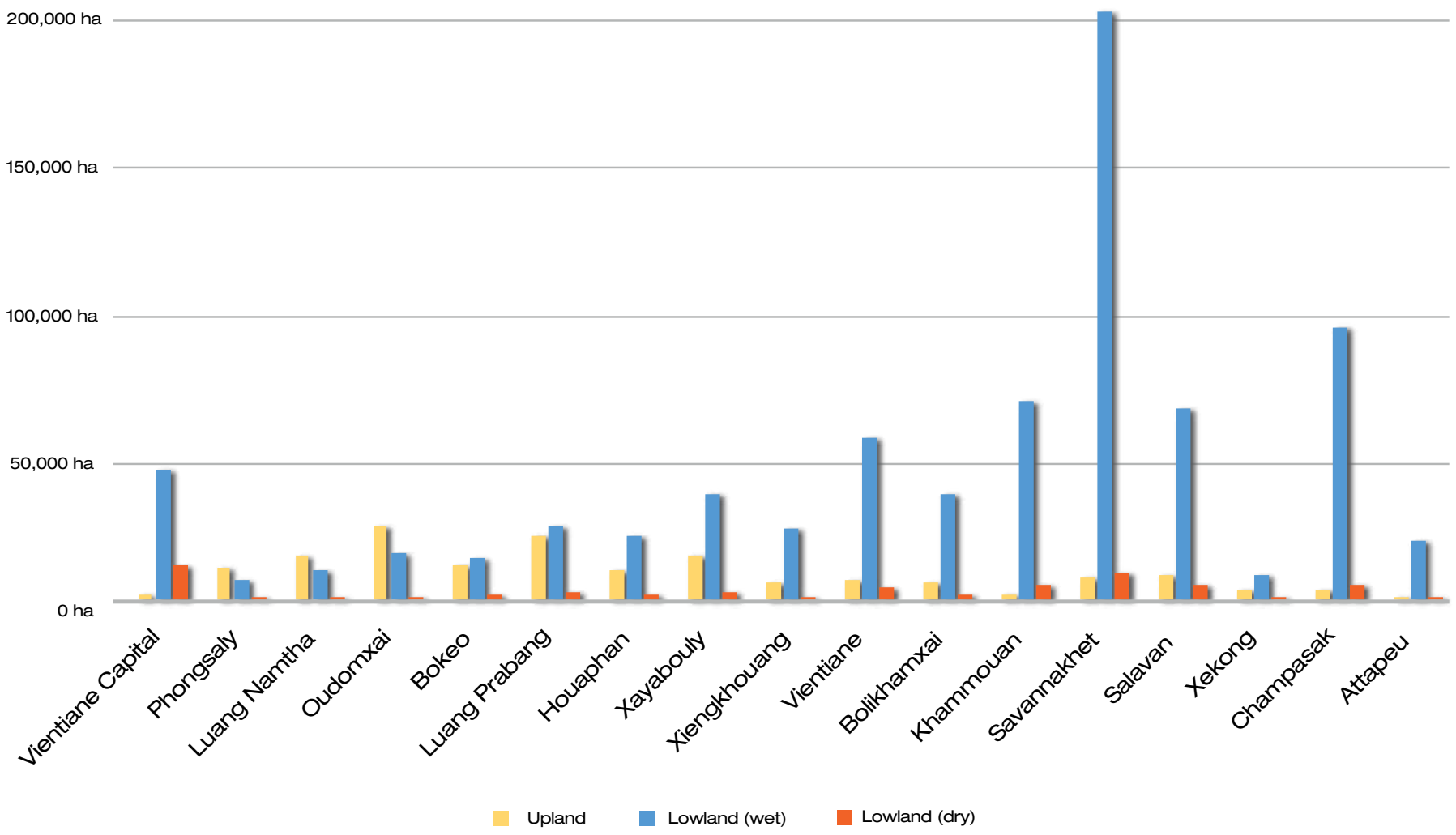
The steady growth in the Lao rice sector from 1999 to 2011 was primarily due to the adoption of new rice production technologies including improved varieties, inorganic fertilisers and new management practices.

The largest increase in area of total rice cultivation, which occurred in Savannakhet and Khammouan, was largely due to key government policies aimed at ensuring food security, promoting commodity production and increasing farmers' incomes. Irrigation schemes invested in by the government to support those priorities have been constructed in these two provinces, contributing more to the enhancement of wet season lowland rice production area, especially during drought years, than to the area under irrigated dry season lowland rice. Decreases in the area under rice in Vientiane Capital and Luang Prabang Province were largely related to rapid urban expansion; many rice growing areas have been replaced with buildings, roads and recreation facilities. In northern Lao PDR there are limited lowland areas for expanding rice production and in some of the lowland areas there are other cash crops such as watermelon, green beans, and various kinds of vegetables planted which require less water and are in high demand.

The area under dry season irrigated lowland rice increased only marginally. High costs of growing dry season rice due to expensive water fees, low efficiency of pumping stations, insufficient maintenance of irrigation facilities, increased wage labour rates caused by outmigration of labour from rural areas led to this development.

The area under rain-fed upland rice production stayed stable between 1999 and 2011. Farmers in the uplands have continued to plant rice under shifting cultivation systems as the main source for their livelihoods. The approach of stabilization of shifting cultivation through promoting rotational cultivation instead can help farmers to cultivate their upland fields in a more visible, systematic way which may also reduce forest impacts.

Figure 4: Total area of upland rice, lowland rice in wet season and lowland rice in dry season in 2010/11 by province



C8 Development of rice varieties

Introduction

In the Lao PDR 90 percent of rice production areas are planted with glutinous rice. Adopting new rice production technologies (e.g. improved varieties, inorganic fertilisers, and management practices) helps to increase rice production. Among these technologies, the adoption of improved varieties since the 1990s has been a key factor in achieving significant productivity increases.

Before the early 1990s, farmers primarily cultivated local and traditional rice varieties. Improved rice varieties were introduced mainly from Thailand and Vietnam and began to be used across small rice production areas along the Mekong Valley in the early 1990s. Around the same period, in collaboration with the International Rice Research Institute (IRRI), the Lao National Rice Research Program developed and released some improved Lao glutinous rice varieties suitable particularly for lowland areas. Subsequently, local rice research and seed multiplication centres have been able to produce more improved Lao glutinous rice varieties throughout the country on a regular basis (Inthapanya *et al.*, 2006).

Lao farmers have gradually replaced local or traditional varieties with improved rice varieties to boost rice productivity and respond to recent increases in market demand. However, in parallel with the adoption of new rice varieties, farmers continue to grow traditional and indigenous varieties of rice, mostly for household consumption.

Patterns in 2011

Improved rice varieties have been widely adopted in the central and southern regions, while farmers in the northern region still mainly plant local upland rice varieties. Improved rice varieties now cover 70 - 80 percent of rice growing areas in the lowlands of most provinces located along the Mekong River. In contrast, almost all of the rain-fed upland rice areas are still planted with local varieties.

As the left map shows, farmers in the north plant slow-maturing glutinous rice varieties in almost half of the total glutinous rice cultivation areas, whereas farmers elsewhere plant more early-maturing and medium-maturing rice varieties. On average, 87 percent of the rice cultivation area is planted with early- and medium-maturing varieties in the south, and 75 percent in central Lao PDR.

Changes between 1999 and 2011

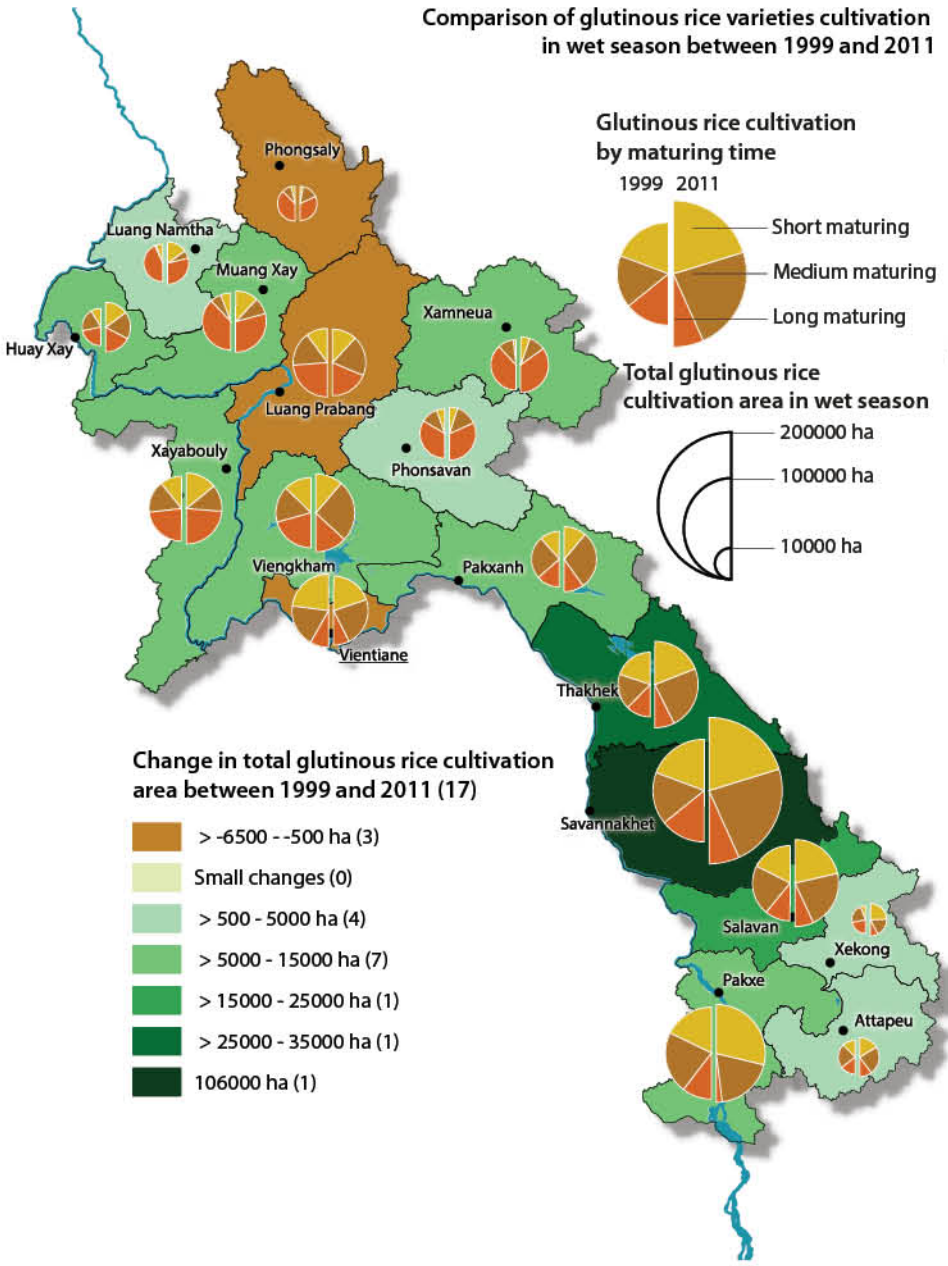
Overall, the area under glutinous rice production increased throughout the Lao PDR between 1999 and 2011, from 627,544 ha to 848,079 ha. The largest increase occurred in Savannakhet Province (by 106,000 ha). In contrast, Vientiane Capital experienced a decrease of about 6,328 ha (from 51,900 ha in 1999 to 45,572 ha in 2011).

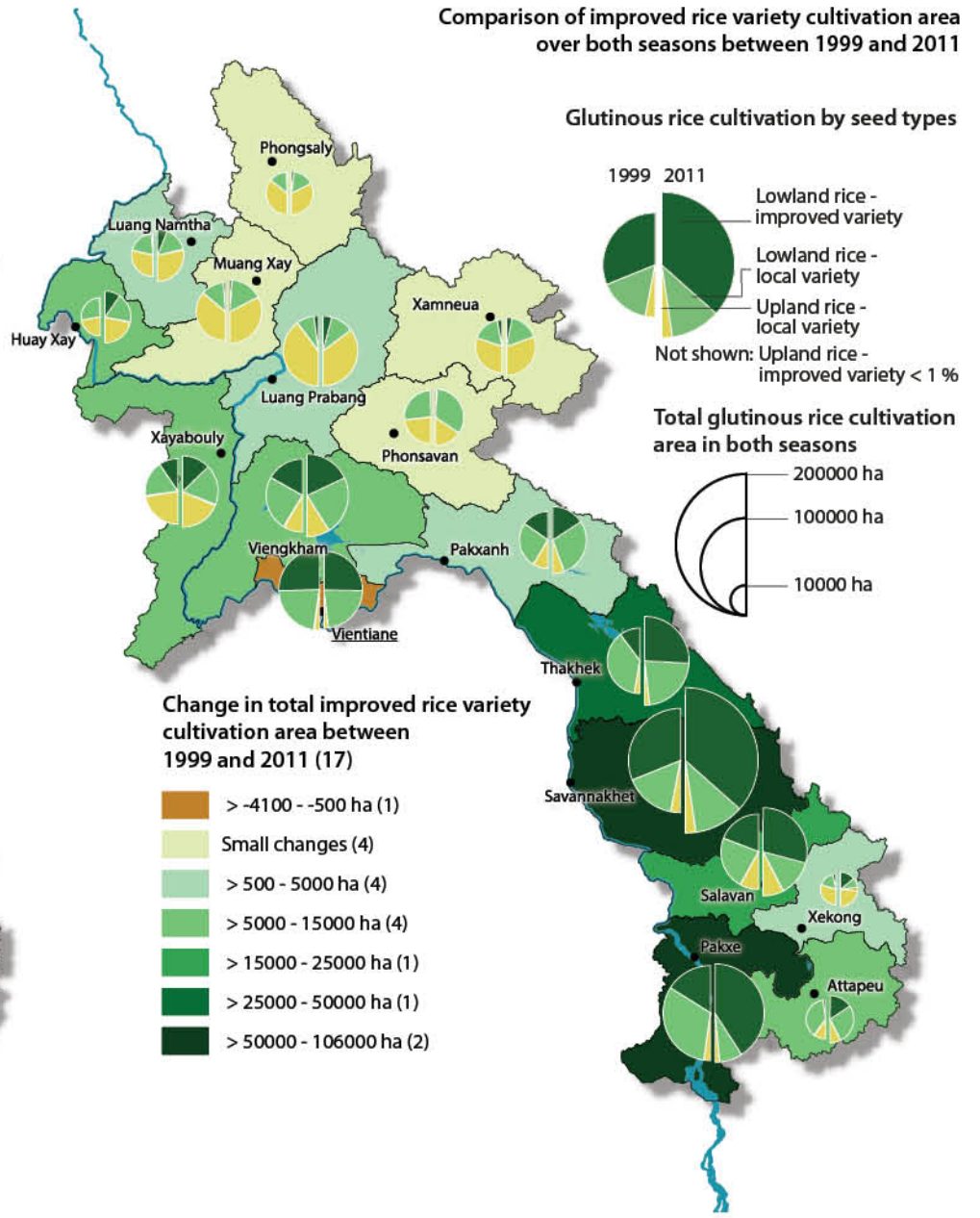
The area under improved rice varieties nationally increased from 19 percent in 1999 to about 31 percent in 2011. In the southern provinces, the use of improved rice varieties has drastically increased, whereas the use of local varieties has dramatically decreased. In the northern provinces, farmers still cultivate mostly local rice varieties, primarily for household consumption rather than for markets. Exceptions are some lowland areas suitable for rice production in Xayabouly and in Bokeo.

Interpretations

The high adoption of improved rice varieties in the lowlands in central and southern Lao PDR is largely due to these regions' access to new varieties. They are closer to the main rice research and seed multiplication centres, namely Naphork Research Centre in Vientiane Capital, Thasano Research Centre in Savannakhet Province, and Phon Ngam Research Centre in Champasak Province. The extension services provided by the government and various donor projects through these centres have played an important role in Lao farmers' adoption of new rice varieties. Just a few areas have seen a decline in the total area of glutinous rice planted, for example Vientiane Capital which experienced rapid urbanization between 1999 and 2011.

Finally, in the last decade, there was a remarkable shift from planting glutinous to non-glutinous rice varieties. In response to growing market demand and resultant higher prices, farmers are gradually switching to growing more non-glutinous rice varieties. The shift to more non-glutinous varieties was promoted in the Agriculture and Forestry Development Strategy 2025, which includes a plan to increase the production ratio of non-glutinous rice to 30 percent of the national rice cultivation area (MAF, 2015).


Comparison of glutinous rice varieties cultivation in wet season between 1999 and 2011
Glutinous rice cultivation by maturing time
1999 2011
Short maturing
Medium maturing
Long maturing
Total glutinous rice cultivation area in wet season
200000 ha
100000 ha
10000 ha
Phongsaly
Luang Namtha
Muang Xay
Huay Xay
Xamneua
Luang Prabang
Xayabouly
Phonsavan
Viengkham
Pakxanh
Vientiane
Thakhek
Savannakhet
Salavan
Xekong
Pakxe
Attapeu
Change in total glutinous rice cultivation area between 1999 and 2011 (17)
> -6500 - -500 ha (3)
Small changes (0)
> 500 - 5000 ha (4)
> 5000 - 15000 ha (7)
> 15000 - 25000 ha (1)
> 25000 - 35000 ha (1)
106000 ha (1)


Comparison of improved rice variety cultivation area over both seasons between 1999 and 2011
Glutinous rice cultivation by seed types
1999 2011
Lowland rice - improved variety
Lowland rice - local variety
Upland rice - local variety
Not shown: Upland rice - improved variety < 1 %
Total glutinous rice cultivation area in both seasons
200000 ha
100000 ha
10000 ha
Phongsaly
Luang Namtha
Muang Xay
Huay Xay
Xamneua
Luang Prabang
Xayabouly
Phonsavan
Viengkham
Pakxanh
Vientiane
Thakhek
Savannakhet
Salavan
Xekong
Pakxe
Attapeu
Change in total improved rice variety cultivation area between 1999 and 2011 (17)
> -4100 - -500 ha (1)
Small changes (4)
> 500 - 5000 ha (4)
> 5000 - 15000 ha (4)
> 15000 - 25000 ha (1)
> 25000 - 50000 ha (1)
> 50000 - 106000 ha (2)

C9 Main annual crops

Introduction

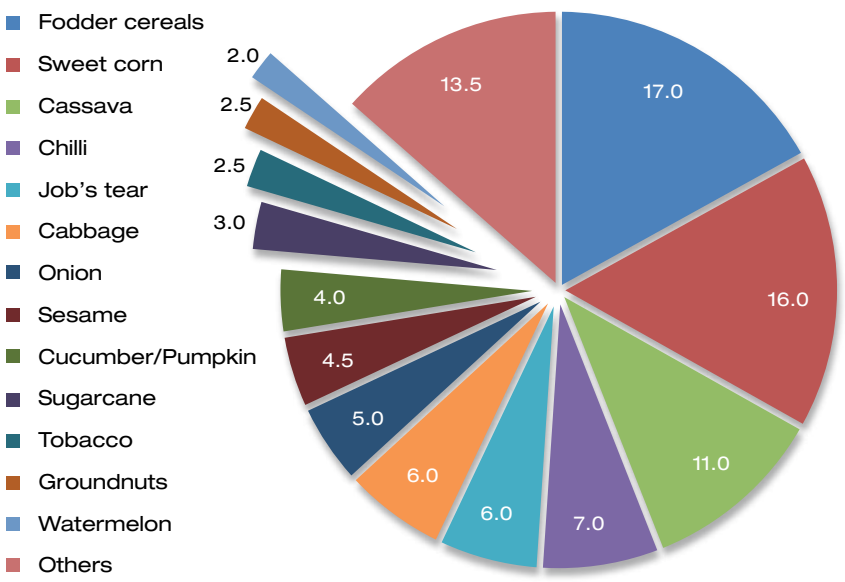
Of all agricultural land in the Lao PDR, 80 percent is devoted to annual crop cultivation (1.19 million hectares). A vast majority of this area is under rice production, the main staple food crop. However, agriculture is becoming more diversified and commercialized in the Lao PDR. The number of farmers growing non-rice crops in their home gardens and along river banks, especially along the Mekong River or its tributaries, has gradually increased. Some farmers in irrigated areas use part of their rice fields for non-rice crops in the dry season instead of for growing rice. The diversification of crop cultivation has not only improved food security and added nutritional value at the household level, but surpluses are sold in domestic and foreign markets.

Patterns in 2011

Over 100 different kinds of annual crops were grown in the Lao PDR in 2011, broadly falling into the following categories: (a) cereals, (b) stimulants, (c) fiber crops, (d) flowers, (e) fodder crops, (f) leafy and stem vegetables, (g) leguminous crops, (h) oilseed crops, (i) root, bulb and tuberous vegetables, (j) spices, (k) sugar crops, (l) fruit-bearing vegetables, (m) herbs, and (n) others. In reality, the variety of annual crops grown is even greater, as the census only reports data for crops planted on more than 100 m².

The map shows the dominant annual crops (aside from rice) planted in villages throughout the Lao PDR in terms of cultivated area. Fodder cereals, sweet corn and cassava are the most commonly planted annual crops with the largest number of villages growing them as main crop (17 percent, 16 percent and 11 percent of all villages respectively; see Figure 5). Other dominant annual crops popularly grown were chilli (7 percent), Job's tears (6 percent), cabbage (6 percent), onion (5 percent), sesame (4.5 percent), cucumber and pumpkin (4 percent), sugarcane (3 percent), tobacco (2.5 percent), groundnuts (2.5 percent), watermelon (2 percent) and others (13.5 percent).

Figure 5: Proportion of villages by dominant non-rice annual crop in the village



The majority of Lao farmers feed their livestock with fodder cereals (e.g. maize) and natural pasture grass or with by-product crops (e.g. rice straw). Xiengkhouang is well known for its natural pasture grazing areas for large livestock. Fodder crops were particularly significant in the northern provinces. Xayabouly, Oudomxai, Bokeo and Houaphan are known for their extensive maize production, which is primarily produced as livestock feed. Vietnam, Thailand and China are the main markets for maize produced in these provinces.

Sweet corn is grown for both household consumption and sale. In northern but also in eastern and central Lao PDR, it is predominantly grown for household consumption. However, sweet corn production has grown to a commercial scale in Vientiane Province and Vientiane Capital, surrounding the Lao Agro Industry Company. The company which has a factory in Thoulakhom District, Vientiane Province uses sweet corn to produce sweet corn milk, baby corn and other canned vegetable products for sale in domestic and foreign markets.

Cassava production has also expanded rapidly. Around 10 percent of agricultural villages (939 villages) throughout the Lao PDR grow cassava as their main annual crop after rice. In recent years, production has reached commercial scales. Due to its proximity to the Lao Indochina Starch Factory, located on the outskirts of Vientiane Capital, cassava has been most extensively planted in Vientiane Capital, Vientiane and Bolikhamxai Provinces. Cassava growers export their products in the form of fresh root or dry chips to neighbouring Thailand and Vietnam.

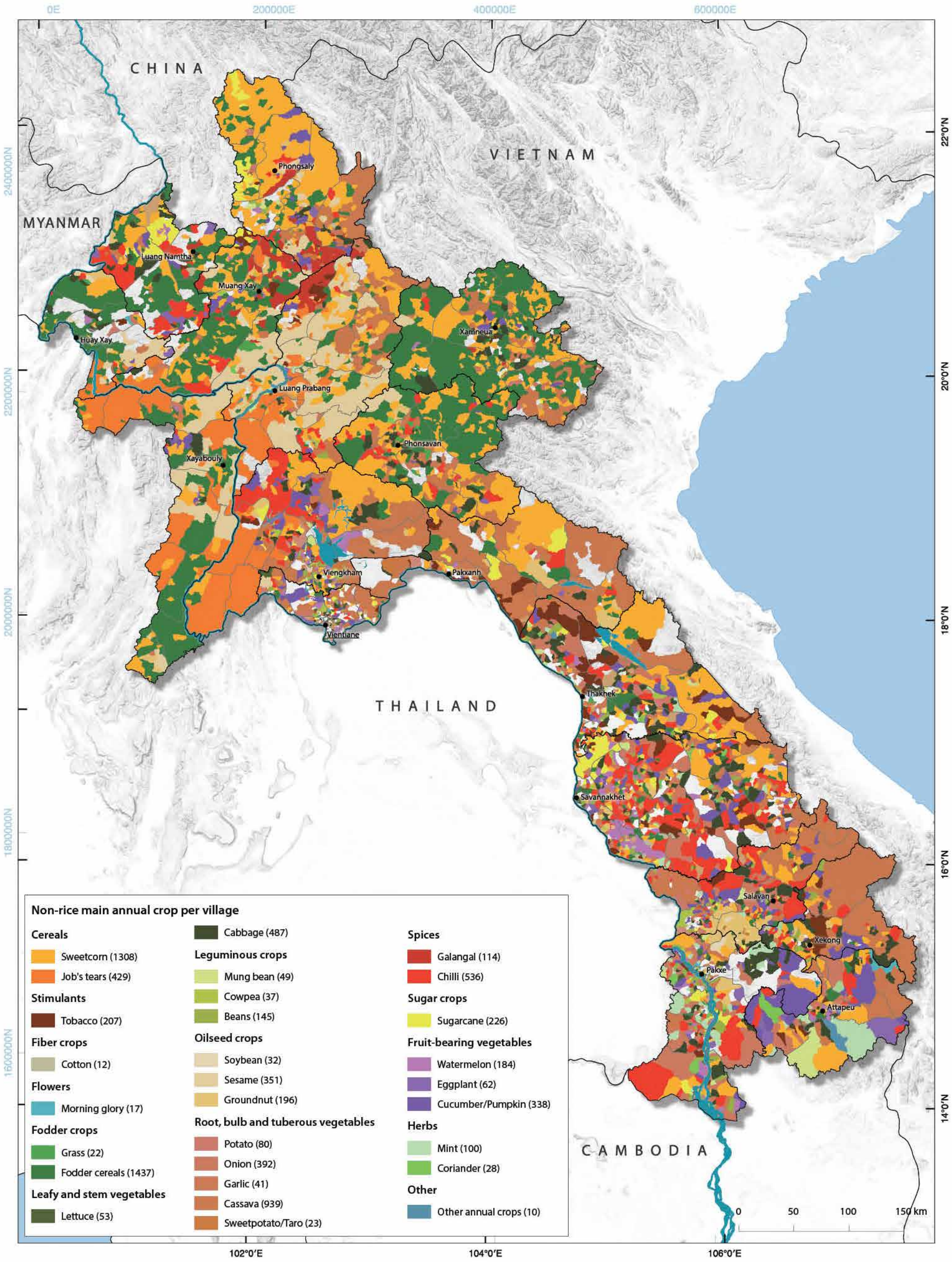
Over 500 villages grow chilli in their home gardens as their main annual crop for consumption and for sale, but production at a commercial scale is also found in many communities throughout the country. Fresh and dried chilli are mainly exported to Thailand but are also consumed fresh and dried domestically, typically in the form of *jeow* (sauces or pastes), e.g. *jeow bong* Luang Prabang, *jeow Namphak* Salavan or *jeow Pabam* Xamneua.

The map also depicts the cultivation hot spots of Job's tears in and around Xayabouly (in orange), tobacco in Bolikhamxai and Khammouan (brown), sugarcane in northwest Savannakhet, northern Luang Namtha and western Phongsaly (yellow), galangal in the border areas of Phongsaly, Oudomxai and Luang Prabang (red), and a number of other crop hot spots.

Interpretations

Most of the annual crops grown in the Lao PDR are produced on a small scale and predominantly for household consumption. However, an increasing number of annual crops such as cassava, maize, and sweet corn, and even some varieties of rice, such as "small chicken rice" (*khao gai noy*) are grown at increasing scales to supply expanding international market demand and also to sell to domestic agro-processing factories and markets. Low material inputs, and also the often organic production practices used even for the cultivation of annual crops in the Lao PDR generates special demand in other countries for Lao agricultural products. To further tap into special areas of market demand in the future, Geographical Indicators (GI) are currently under development, e.g. for "small chicken rice" produced by farmers in Xiengkhouang and Houaphan Provinces.

C9 Main annual crops



C10 Crop clusters - annual crops

Introduction

In the Lao PDR, around 80 percent of agricultural land is devoted to annual crops. Among the most important annual crops (aside from rice) are: fodder cereals (mainly maize), sweet corn, cassava, sugarcane, soybean, Job's tears, peanut, cowpea, tobacco, galangal, sesame and lemon basil. Annual crops are grown on commercial scales, near markets or close to borders (where transport links often connect to neighbouring country markets) and often in concentrated clusters where many households across an area all cultivate a common crop.

Patterns in 2011

The main map displays the share of the area under selected annual crops to the total annual crop area. A high degree of regional concentration among certain crops, referred to as crop clusters, is apparent. The smaller inset maps portray the cultivation patterns of these key annual cash crop clusters in more detail.

Galangal is a traditional Lao condiment commonly used as ingredient for many Lao dishes as well as in pharmaceutical products. Around 91 percent of the cultivated galangal is concentrated at the joint borders of Phongsaly, Oudomxai and Luang Prabang, and sold to China. Most producing villages use a small percentage of their agricultural land for galangal production, though planting areas range between 25 percent and almost 47 percent in a few villages. In general, however, less than 1 percent of the total agricultural land used for annual crops nationally (excluding rice) is under galangal cultivation.

Sesame cultivation (both black and white varieties) is mostly confined to the northern provinces, particularly Luang Prabang, Oudomxai and Xayabouly. The sesame production area in these three provinces accounts for 84 percent of the country's total area under sesame. Sesame is grown both for local consumption and for export, in particular to China where sesame oil is extracted. Lao farmers usually cultivate sesame by intercropping it with other crops and in home gardens. In general, 4 percent of the agricultural land used for annual crops (excluding rice) is under sesame.

Fodder cereals cultivation (mainly maize) occurs primarily in two major production zones. The first spans Xiengkhouang and Houaphan Provinces and covers around 23 percent of the total fodder cereals cultivation area in the Lao PDR. The second is in Xayabouly, Oudomxai, Bokeo and Luang Prabang Provinces, accounting for 61 percent of the total. Some villages devote up to 96 percent of their agricultural land to fodder cereals cultivation, especially in the south of Xayabouly. But in general, around 40 percent of agricultural land used for annual crops (excluding rice) is under fodder cereals cultivation.

Over 67 percent of the total production area of Job's tears is concentrated in and around Xayabouly Province. Some villages use up to 78 percent of their agricultural land for Job's tears production. Job's tears is grown primarily during the wet season, often as an upland rain-fed crop. In general, 15 percent of the agricultural used land for annual crops (excluding rice) is under Job's tears cultivation.

Peanuts are grown in relatively scattered clusters throughout the Lao PDR, but are predominantly planted in two geographical areas: In Xayabouly Province, home to 21 percent of the total peanut cultivation area in the country, and in the area between Salavan and Champasak Provinces which account for 22 percent of the total area under peanut cultivation. Villages in these two areas can devote up to 38 percent of their agricultural land to peanut production. But in general, only 3 - 4 percent of agricultural land used for annual crops (excluding rice) is under peanut production.

Tobacco is also grown across relatively scattered areas in the Lao PDR, but Bolikhamxai and Khammouan share certainly the biggest cluster with a total of 28 percent of the cultivation area. The majority of villages here use only some percent of their village agricultural land, but some use up to 51 percent of their land for tobacco production. Tobacco is grown essentially in the dry season, often on dry rice fields. In general, 1 - 2 percent of the agricultural land used for annual crops (excluding rice) is under tobacco.

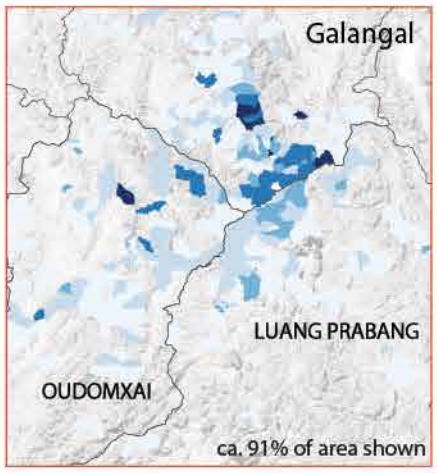
Cowpeas are cultivated mainly in the south of Xayabouly Province, which contains over 50 percent of the total area under cowpea production in the Lao PDR. Farmers usually use a relatively small portion of village agricultural land (under 1 percent of annual crop land, excluding rice area) for cowpea production.

Salavan, Xekong, Champasak and Attapeu together account for 41 percent of the total lemon basil cultivation area in the country. Lemon basil is the most common type of basil used in the Lao PDR and it is a key ingredient for various Lao dishes. In general, under 0.1 percent of the agricultural land used for annual crops (excluding rice) is under lemon basil production.

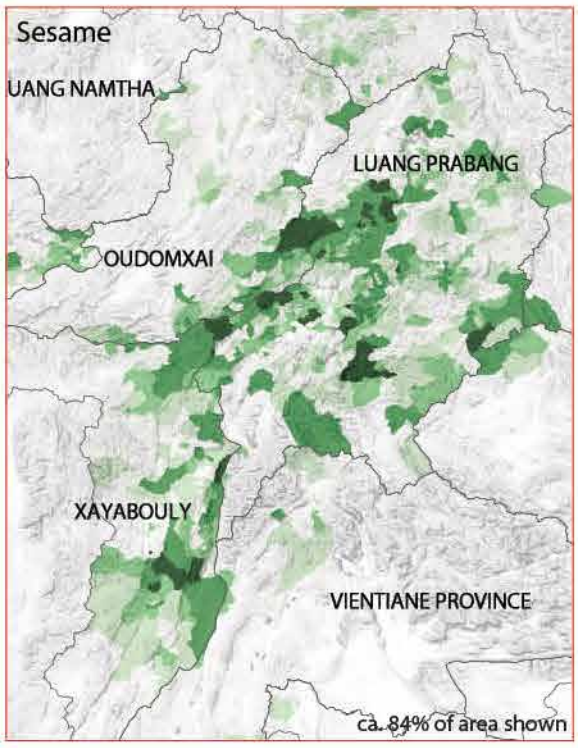
Interpretations

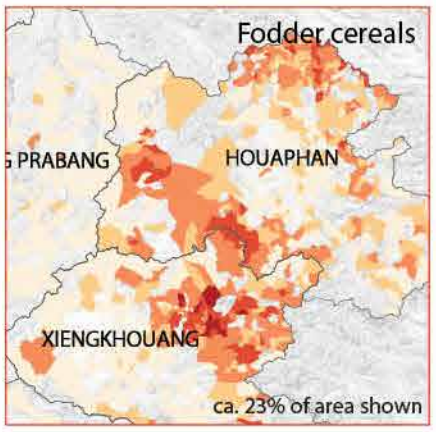
Annual crop cultivation for commercial purposes (also referred to as annual cash crops) has increased in recent years in the Lao PDR. This reflects a transition currently underway in the country, where agriculture is becoming more commercialized and farmers are growing various crops at larger scales in response to the opening up of markets. An increase was observed in the proportion of farm households producing crops primarily for market instead of for home consumption from around 6 percent in 1999 to 33 percent in 2011 (see B6).

The concentration of commercial production of particular annual crops in certain clusters is largely related to market access, road access and irrigation facilities. Many types of annual crops were densely grown in these clusters in 2011. The highest proportion of farm households growing crops mainly for sale were recorded in the following provinces: Xayabouly (55 percent), Luang Prabang (45 percent), Luang Namtha (40 percent), Champasak (40 percent) and Oudomxai (30 percent).

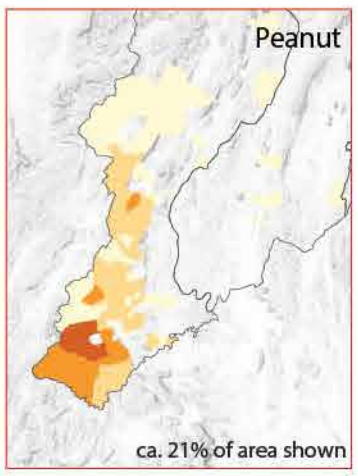


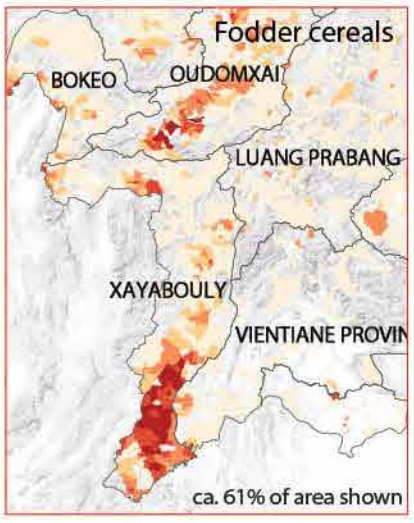
*Galangal
0.0 %
> 0.0 - 1.0 %
> 1.0 - 5.0 %
> 5.0 - 10.0 %
> 10.0 - 25.0 %
> 25.0 - 46.8 %



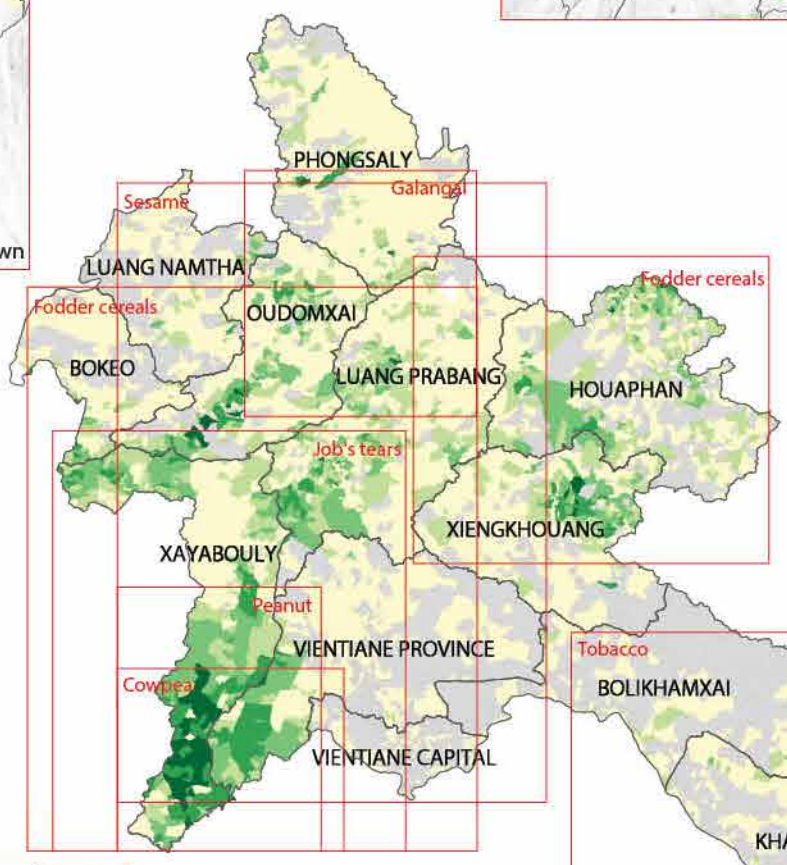


*Sesame
0.0 %
> 0.0 - 1.0 %
> 1.0 - 5.0 %
> 5.0 - 10.0 %
> 10.0 - 25.0 %
> 25.0 - 49.3 %





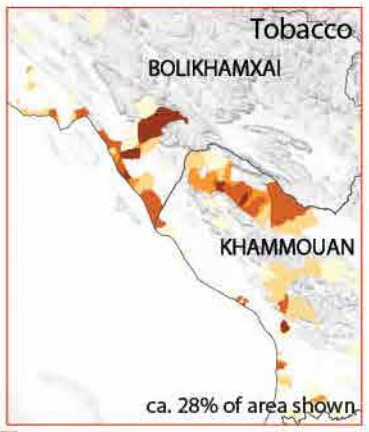
*Fodder cereals
0.0 %
> 0.0 - 10.0 %
> 10.0 - 25.0 %
> 25.0 - 50.0 %
> 50.0 - 75.0 %
> 75.0 - 96.3 %

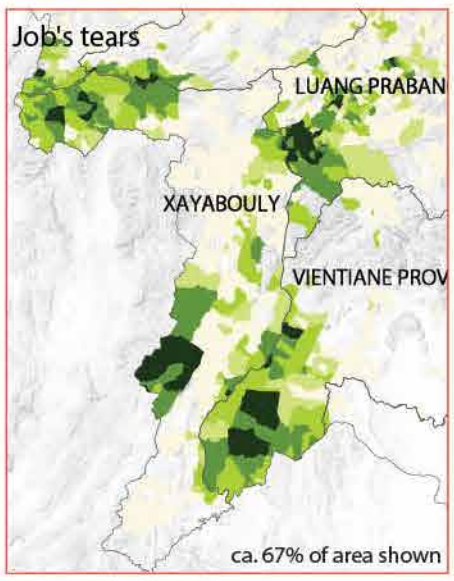


Percentage of selected annuals of total annual crop area
0 %
> 0 - 20 %
> 20 - 40 %
> 40 - 60 %
> 60 - 80 %
> 80 - 100 %

Annual crop clusters

*Legend: Percentage of agricultural land under crop at village level

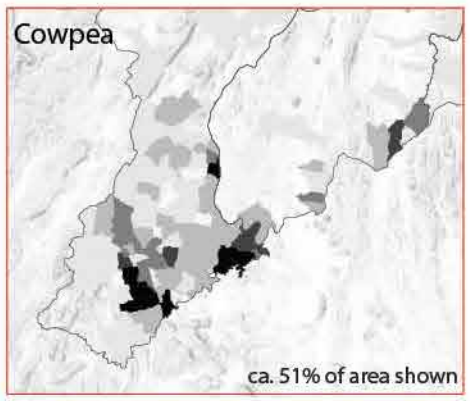




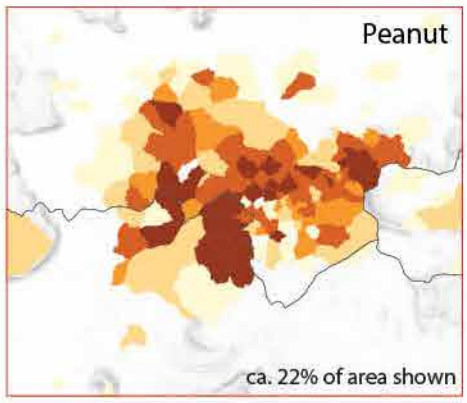
*Job's tears
0.0 %
> 0.0 - 5.0 %
> 5.0 - 15.0 %
> 15.0 - 30.0 %
> 30.0 - 50.0 %
> 50.0 - 77.7 %

*Peanut
0.0 %
> 0.0 - 1.0 %
> 1.0 - 5.0 %
> 5.0 - 10.0 %
> 10.0 - 20.0 %
> 20.0 - 37.8 %

*Tobacco
0.0 %
> 0.0 - 1.0 %
> 1.0 - 5.0 %
> 5.0 - 10.0 %
> 10.0 - 25.0 %
> 25.0 - 50.7 %



*Cowpea
0.0 %
> 0.0 - 0.5 %
> 0.5 - 2.0 %
> 2.0 - 5.0 %
> 5.0 - 10.0 %
> 10.0 - 20.2 %



*Lemon basil
0.0 %
> 0.0 - 0.1 %
> 0.1 - 0.2 %
> 0.2 - 0.5 %
> 0.5 - 0.9 %

C11 Maize

Introduction

Maize or corn (*Zea mays*) is an annual cereal crop from Central America that has been cultivated for thousands of years in human history and is used for food, fodder and as a source of oil.

In recent years, more commercialized, market oriented agricultural production has been promoted. Maize is among the country's priority crops, with high local and international market demand. It is grown mostly for sale as livestock feed, and is sold to buyers in Vietnam, Thailand and China. The production area of maize in the Lao PDR increased significantly within the last decade and it now ranks second after rice in terms of total area under cultivation.

Patterns of maize cultivation in 2011

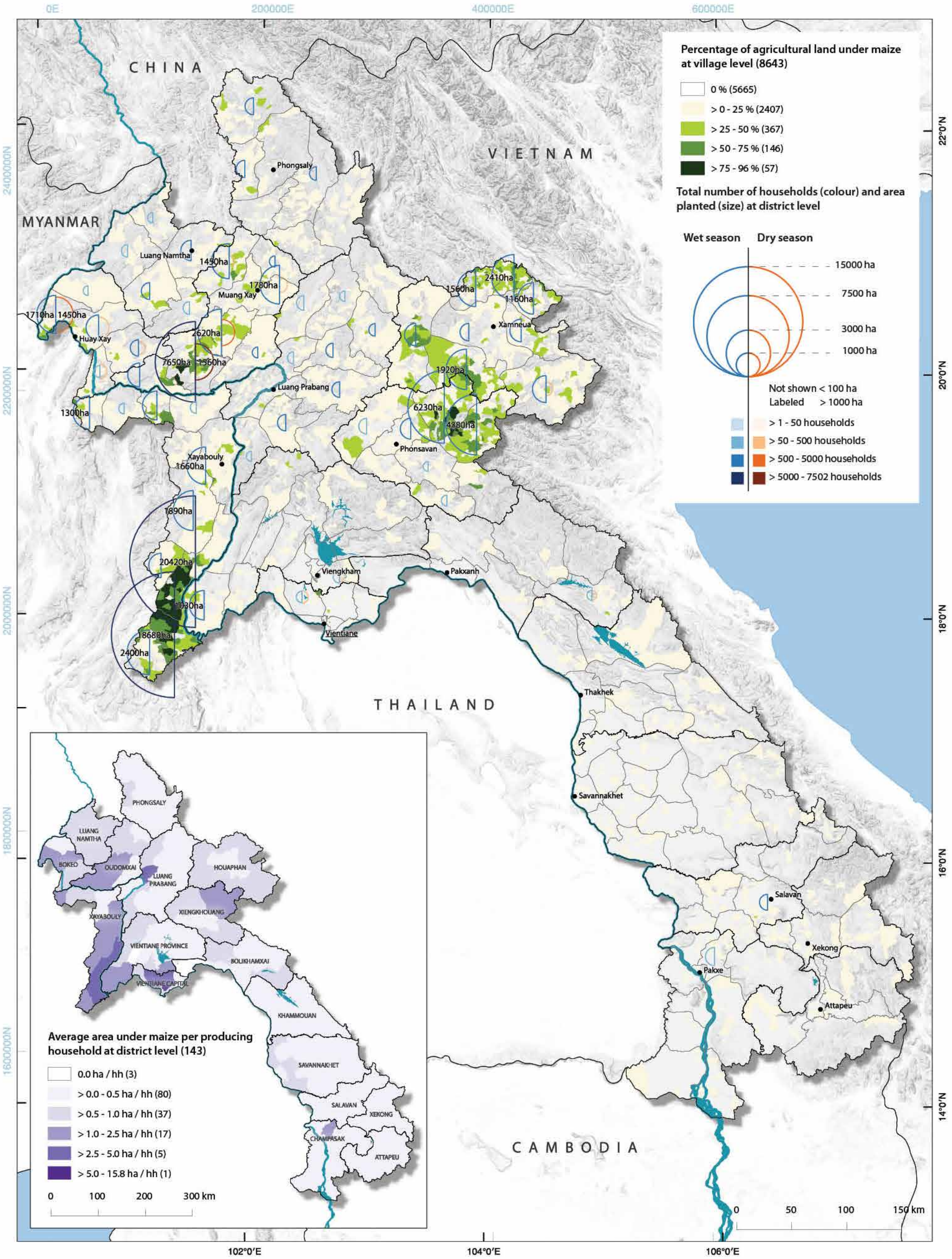
In the Lao PDR, maize is grown mainly on rain-fed fields during the wet season. Of the total area under maize, 93 percent is cultivated during the wet season and 7 percent during the dry season. There is 101,630 ha of maize under cultivation, of which almost half (48,509 ha) was grown in Xayabouly, particularly in Kenthao and Paklai Districts which have 18,680 and 20,420 ha of maize respectively. This region has good delivery systems and market access to Thailand.

Other cluster areas of maize production are the regions between Phonsavan (the provincial capital of Xiengkhouang) and Xamneua (the provincial capital of Houaphan) and in the three districts in the far north of Houaphan. These areas enjoy good access to Vietnam, which is one of the top markets for maize produced in the Lao PDR. In total, there are around 22,000 ha of maize grown in these areas.

As the map shows, there is a third cluster area of significant maize production in Oudomxai and a smaller area in Bokeo. Approximately 22,000 ha are grown in these two areas, of which 5,000 ha is grown during the dry season, which represents 75 percent of all dry season maize production in the Lao PDR.

In total, 2,977 villages in the Lao PDR cultivate maize. Most of them are located in the northern part of the country. While 81 percent of these villages use under 25 percent of their agricultural land for maize, in the above described three cluster regions, many villages use 50 percent or more of their agricultural land for maize cultivation (see C10).

More than 80,000 agricultural households are engaged in maize production on a total area of 101,630 ha, with a countrywide average of almost 1.3 ha per producing household. As the inset map depicts, the average area per producing household in the cluster regions is higher than in other regions in the Lao PDR. The only district with more than 5.0 ha/hh, with an average of 15.8 ha/hh, is Xaisettha District in Vientiane Capital, which is most likely because people who reside in this urban district plant maize in other regions of the country.


0E
200000E
400000E
600000E
2400000N
2200000N
2000000N
1800000N
1600000N
22°0'N
20°0'N
18°0'N
16°0'N
14°0'N
102°0'E
104°0'E
106°0'E
CHINA
VIETNAM
MYANMAR
THAILAND
CAMBODIA
Phongsaly
Luang Namtha
1450ha
1780ha
Muang Xay
1710ha
1450ha
Huay Xay
2620ha
7650ha
1560ha
Luang Prabang
1300ha
Xayabouly
1660ha
1890ha
20420ha
1030ha
18680ha
2400ha
Viengkham
Vientiane
Paksanh
2410ha
1560ha
1160ha
Xamneua
1920ha
6230ha
4380ha
Phonsavan
Thakhek
Savannakhet
Salavan
Xekong
Pakxe
Attapeu
0 50 100 150 km
Percentage of agricultural land under maize at village level (8643)
0 % (5665)
> 0 - 25 % (2407)
> 25 - 50 % (367)
> 50 - 75 % (146)
> 75 - 96 % (57)
Total number of households (colour) and area planted (size) at district level
Wet season
Dry season
15000 ha
7500 ha
3000 ha
1000 ha
Not shown < 100 ha
Labeled > 1000 ha
> 1 - 50 households
> 50 - 500 households
> 500 - 5000 households
> 5000 - 7502 households
PHONGSALY
LUANG NAMTHA
BOKEO
OUDOMXAI
LUANG PRABANG
HOUAPHAN
XAYABOULY
XIENGKHOUANG
VIENTIANE PROVINCE
VIENTIANE CAPITAL
BOLIKHAMXAI
KHAMMOUAN
SAVANNAKHET
SALAVAN
XEKONG
CHAMPASAK
ATTAPEU
Average area under maize per producing household at district level (143)
0.0 ha / hh (3)
> 0.0 - 0.5 ha / hh (80)
> 0.5 - 1.0 ha / hh (37)
> 1.0 - 2.5 ha / hh (17)
> 2.5 - 5.0 ha / hh (5)
> 5.0 - 15.8 ha / hh (1)
0 100 200 300 km

Changes in maize cultivation patterns between 1999 and 2011

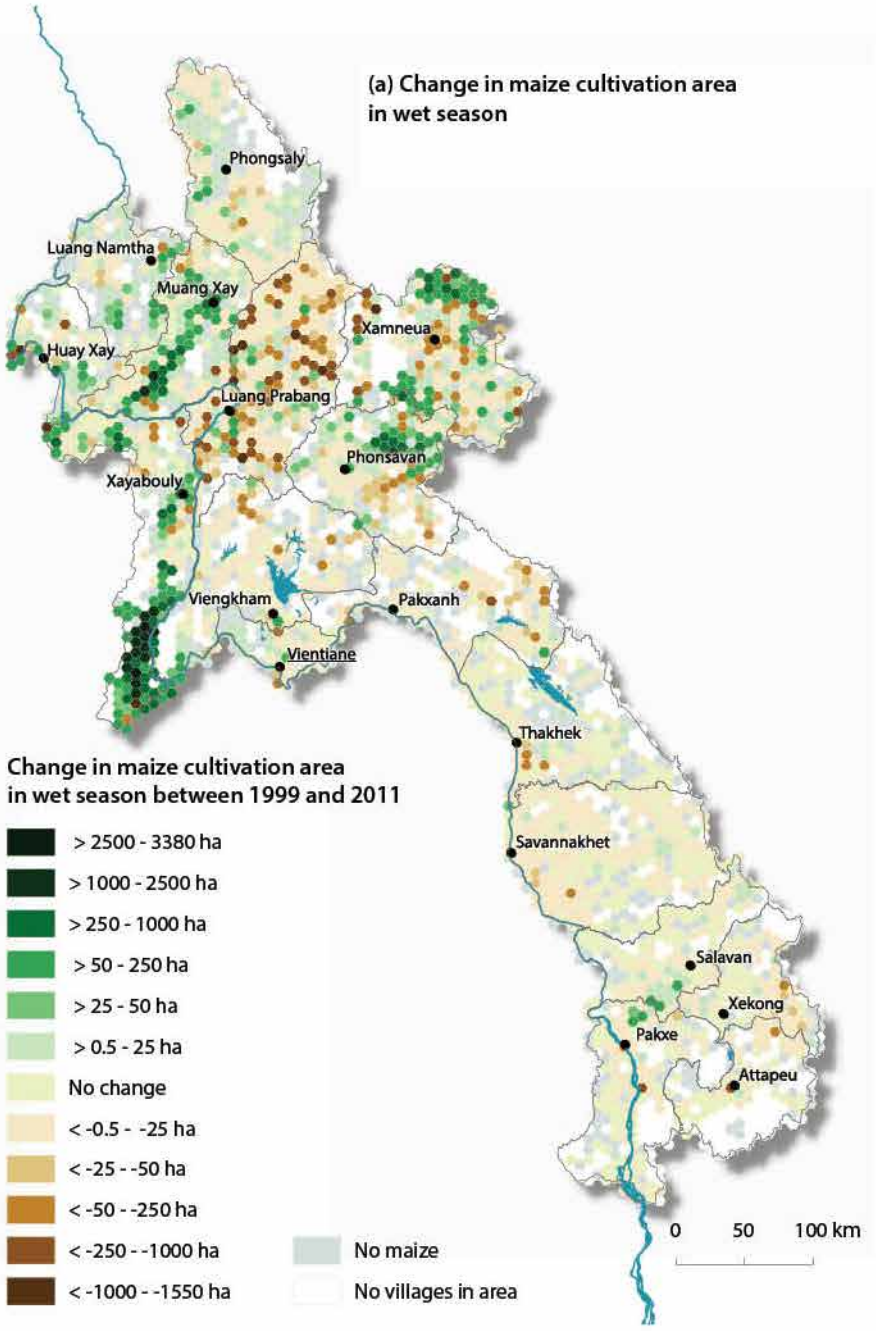
The spatial pattern of maize planting has clearly changed, primarily in terms of wet season cultivation. The total area under maize production in the Lao PDR now is over 20 percent greater than it was in 1999 (78,850 ha).

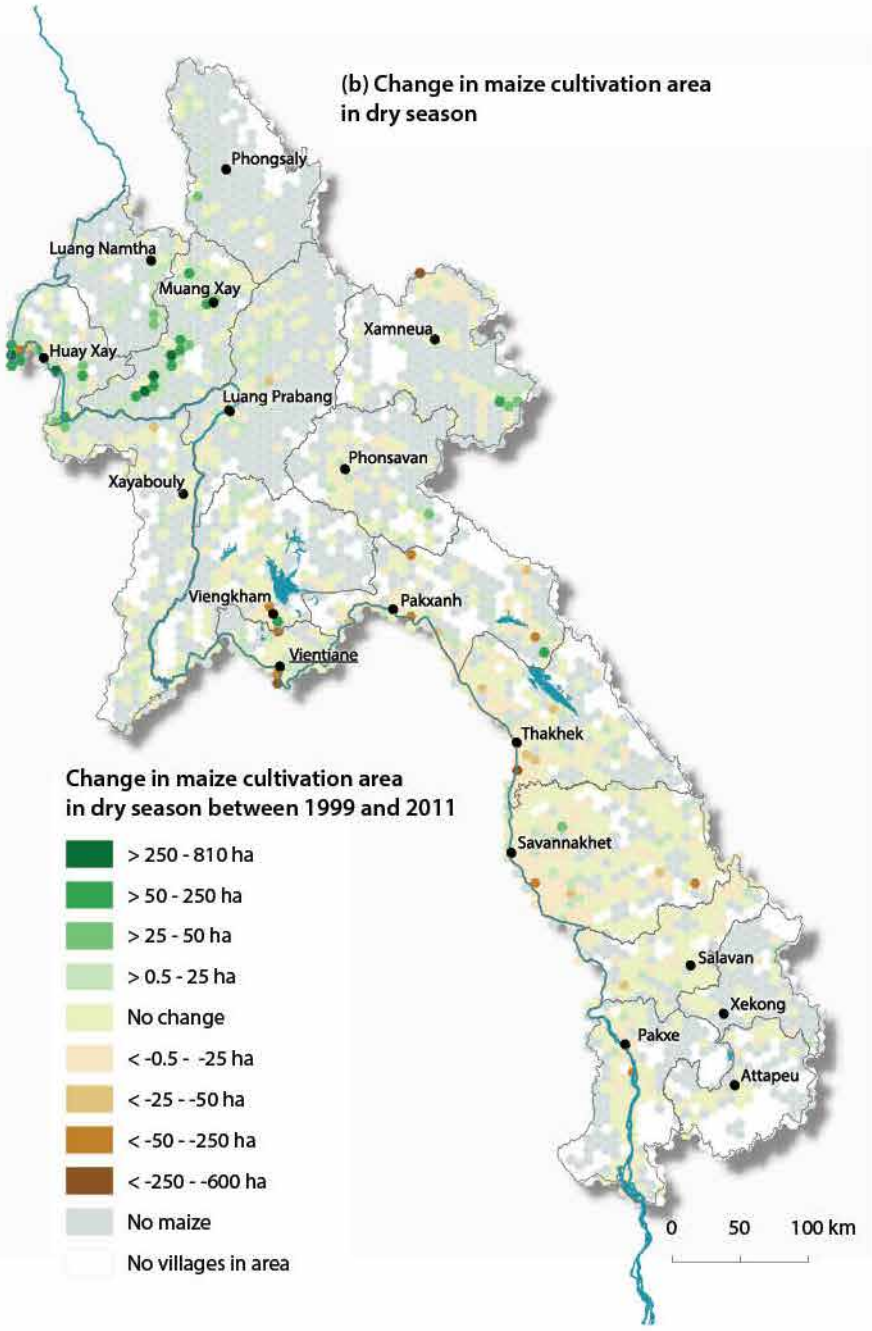
In Luang Prabang Province, the area under maize declined from 27,740 ha in 1999 to only 2,040 ha in 2011, a decrease of 93 percent. Maize cultivation has also declined in central Houaphan, southeastern Xiengkhouang, eastern Bolikhamxai and in almost all regions in southern Lao PDR. Increases in maize production were thus limited to southern Xayabouly, northeastern Xiengkhouang, northern Houaphan and central Oudomxai.

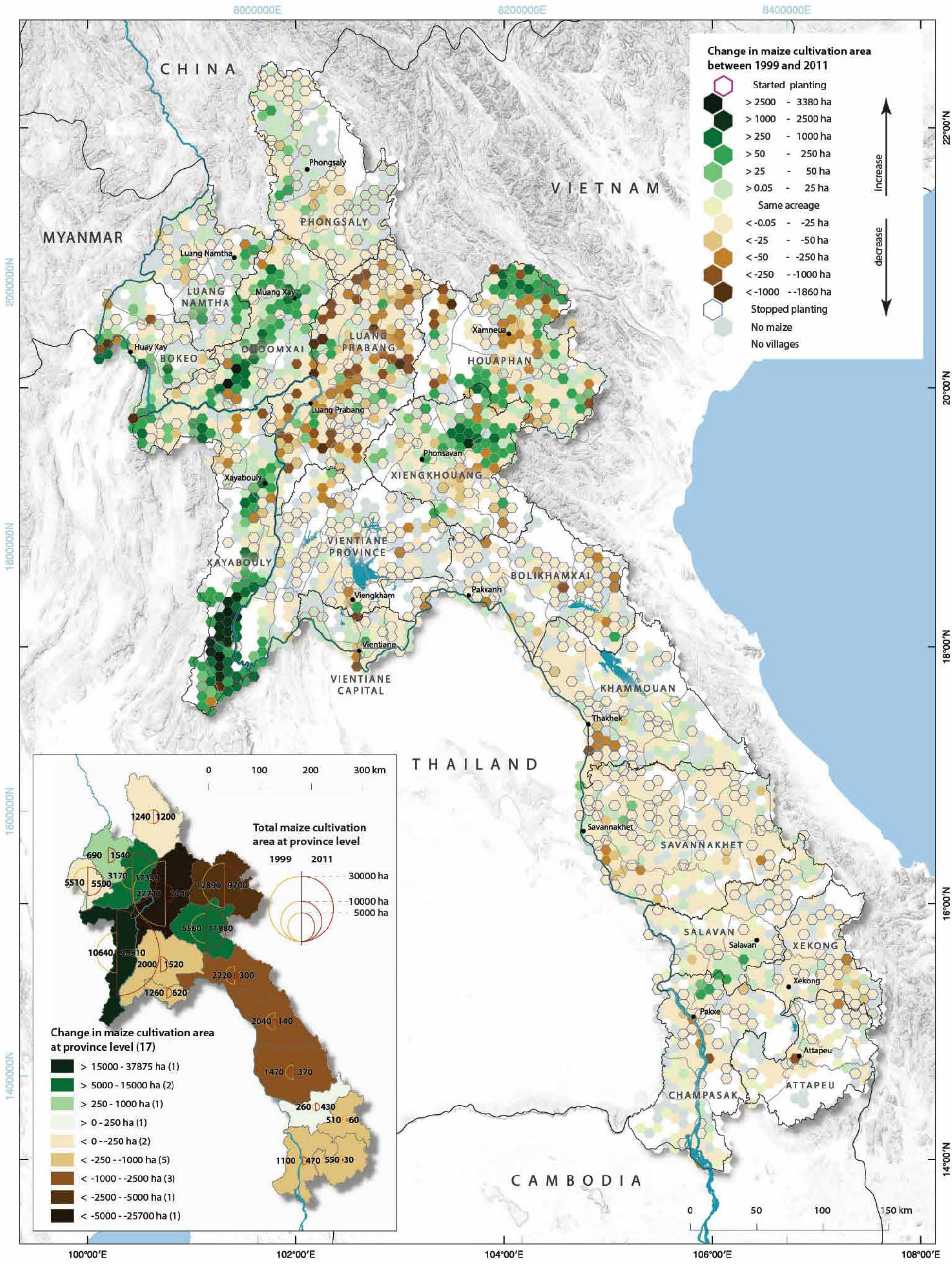
Interpretations

Maize has become one of the main cash crops in northern Lao PDR in recent years. The main drivers for maize expansion are the high demand from neighbouring countries, especially Thailand, Vietnam and China, where rapid economic and demographic growth coupled with higher meat consumption have generated increases in livestock raising and therefore high demand for industrial feed (Newby, 2016). Seeing benefits in terms of rising prices, smallholder farmers along the borders with these three countries have expanded maize production areas rapidly and extensively.

Another important driver contributing to the growth in maize production in the Lao PDR is the Thai government's tax exemption policy under the Ayeyawadi-Chao Phraya – Mekong Economic Cooperation Strategy. This strategy, established in 2003, has made it easier to export maize to Thailand. A further factor is the provision of credit for purchasing seeds and fertilizers (the main inputs in maize production) to Lao farmers by Thai investors in Xayabouly, Chinese investors in Oudomxai, and Vietnamese in Houaphan. Finally, the establishment of post-harvesting processing facilities (dryers) around Oudomxai is an additional factor encouraging maize production.






Change in maize cultivation area between 1999 and 2011
Started planting
> 2500 - 3380 ha
> 1000 - 2500 ha
> 250 - 1000 ha
> 50 - 250 ha
> 25 - 50 ha
> 0.05 - 25 ha
Same acreage
< -0.05 - -25 ha
< -25 - -50 ha
< -50 - -250 ha
< -250 - -1000 ha
< -1000 - -1860 ha
Stopped planting
No maize
No villages
increase
decrease
CHINA
MYANMAR
VIETNAM
LAOS
THAILAND
CAMBODIA
PHONGSALY
LUANG NAMTHA
OUDOMXAI
BOKEO
LUANG PRABANG
XAYABOULY
HOUAPHAN
XIENGKHOUANG
VIENTIANE PROVINCE
VIENTIANE CAPITAL
BOLIKHAMXAI
KHAMMOUAN
SAVANNAKHET
SALAVAN
XEKONG
CHAMPASAK
ATTAPEU
Phongsaly
Luang Namtha
Muang Xay
Huay Xay
Luang Prabang
Xamneua
Phonsavan
Xayabouly
Viengkham
Vientiane
Pakxanh
Thakhek
Savannakhet
Salavan
Xekong
Pakxe
Attapeu
8000000E
8200000E
8400000E
2000000N
1800000N
1600000N
1400000N
22°00'N
20°00'N
18°00'N
16°00'N
14°00'N
100°00'E
102°00'E
104°00'E
106°00'E
108°00'E
0 100 200 300 km
0 50 100 150 km
Total maize cultivation area at province level
1999 2011
30000 ha
10000 ha
5000 ha
1240 1200
690 1540
3170 17340
5510 5500
27740 2040
12890 9700
5560 11880
10640 48510
2000 1520
2220 300
1260 620
2040 140
1470 370
260 430
510 60
1100 470 550 30
Change in maize cultivation area at province level (17)
> 15000 - 37875 ha (1)
> 5000 - 15000 ha (2)
> 250 - 1000 ha (1)
> 0 - 250 ha (1)
< 0 - -250 ha (2)
< -250 - -1000 ha (5)
< -1000 - -2500 ha (3)
< -2500 - -5000 ha (1)
< -5000 - -25700 ha (1)

C12 Job's tears

Introduction

Job's tears (*Coix lacryma-jobi L.*) is a relative of maize in the "*Maydae*" tribe of the grass family, and is commonly called Job's tears or croix seed (Chaisiricharoenkul *et al.*, 2011). It is mainly planted in East and Southeast Asia, including in Japan, China, the Philippines, Myanmar, the Lao PDR and Thailand. Job's tears is a cereal grain containing more nutritious fat and protein than wheat or rice, and is also used in traditional medicine in China and in health foods and drinks (Burnette, 2012).

In the Lao PDR, Job's tears is a traditional crop, cultivated by certain ethnic groups, particularly Khmu and Hmong, for household consumption and animal feed. In periods of rice shortage, Job's tears becomes a supplement carbohydrate for Lao producers. Most commonly, people plant Job's tears in upland rain-fed fields together with upland rice, sesame and various other upland crops, though it is also grown in lowland areas such as along the Mekong River. Job's tears is grown as both a subsistence and a cash crop, though compared to cassava (see C13) or maize (see C11), Job's tears is not a high preference crop for commercial production.

Patterns of Job's tears cultivation in 2011

In 2011, there were in total 37,812 ha of Job's tears planted in the Lao PDR, primarily in western Vientiane Province (14,884 ha), Xayabouly (12,799 ha), southwest Luang Prabang (7,303 ha), southwest Oudomxai (1,590 ha) and southern Bokeo (1,084 ha). However, 7,423 villages (86 percent) do not cultivate Job's tears, whereas 1,220 villages (14 percent) cultivate at least some Job's tears. Finally, there are a few places where villages focus on Job's tears (181 nationally) which plant 30 - 78 percent of their agricultural land with the crop.

Job's tears is generally a wet season crop, and Xanakham District, Vientiane Province has the largest area planted with 10,310 ha in the wet season. In Vientiane Province, Job's tears occupy 11 percent of the total agricultural land, 8 percent in Xayabouly and 6 percent in Luang Prabang. Table 2 gives detailed information about the total area and percentage of Job's tears in the wet, the dry and over both seasons in 2010/11 per province.

The small inset map shows the average household area of Job's tears at district level. The highest average area per producing household is 6 ha in Thoulakhom District, Vientiane Province. In all other districts, an average maximum of 2 ha per household are grown. In total, 38,964 households are engaged in Job's tears production of which over one third are in Xayabouly (14,045 households), around one quarter are in Luang Prabang (10,063 households) and another quarter are in Vientiane Province (9,909 households).

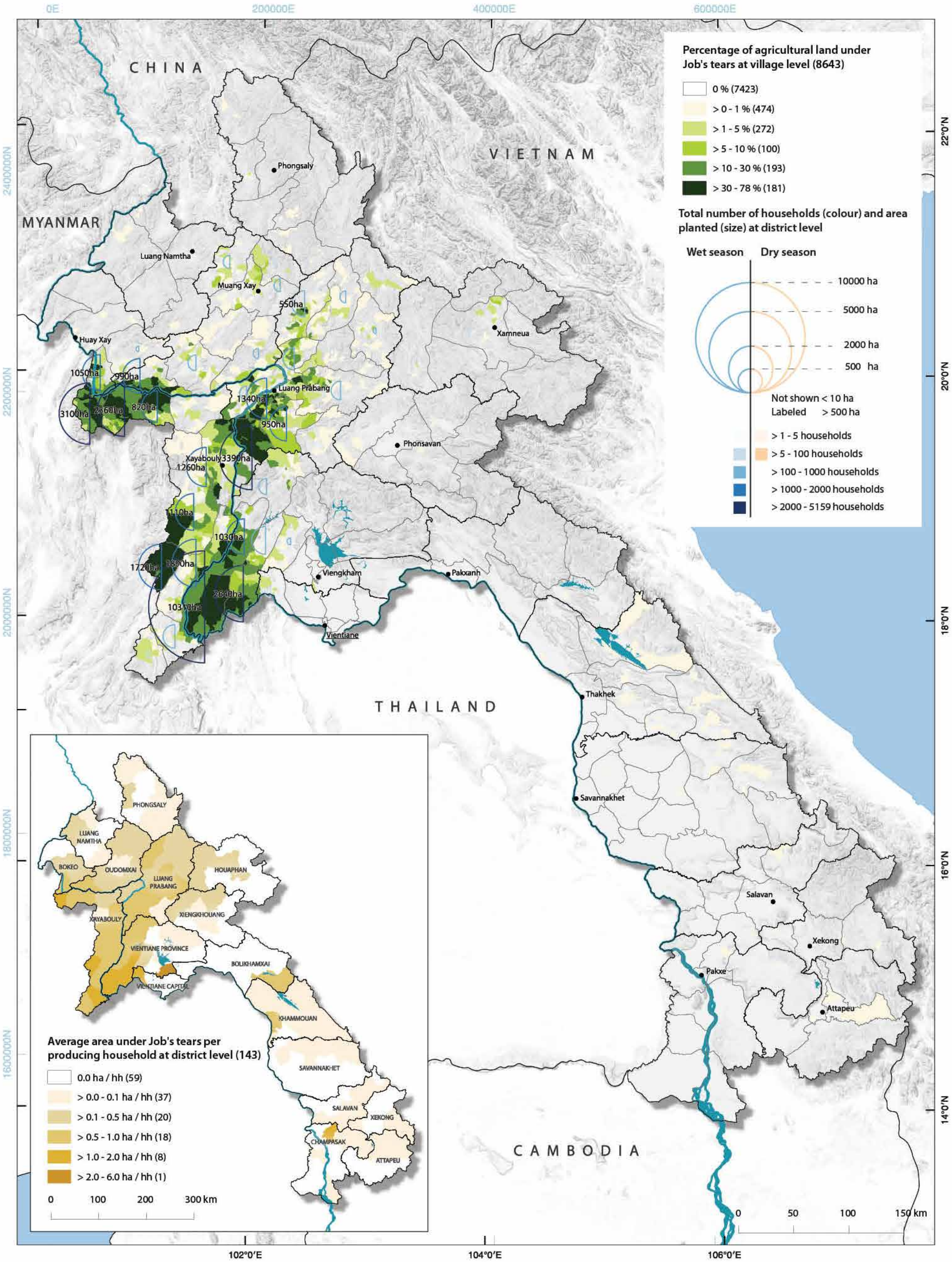
Potential and limitation for Job's tears production

Job's tears is highly adaptive to poor soil conditions, though animal manure is used to improve yields in some places. In addition, Job's tears requires low labour inputs, especially compared to rice production, as it requires weeding only once or twice after planting. The yield per hectare of Job's tears is 57 percent higher than that of upland rice and the harvest period is shorter (Rouw *et al.*, 2002).

Market demand for Job's tears comes primarily from China, Taiwan and also Thailand (Burnette, 2012). However, demand for Job's tears is developing slowly compared to the demand for maize (see C11), cassava (see C13) and other cash crops. The frequent fluctuation in market value of Job's tears generates insecurity for Lao farmers planting the crop. Aside from market access, fluctuating market values and market constraints are key obstacles for agricultural development in the Lao PDR. Additionally, Job's tears is not one of the Ministry of Agriculture and Forestry's priority agricultural commodities, so the cultivation of Job's tears is not explicitly promoted and therefore remains limited to certain regions.

Table 2: Area and percentage of Job's tears in the wet, the dry and over both seasons in 2010/11 per province

Province	Total ha Job's tears 2010 wet season	Job's tears cultivated in 2010 wet season (% of total)	Total ha Job's tears 2011 dry season	Job's tears cultivated in 2011 dry season (% of total)	Total ha Job's tears 2010/11 both season	Percentage Job's tears 2010/11 both season
Vientiane Capital	113.9	100.0	0.0	0.0	113.9	0.3
Phongsaly	3.1	100.0	0.0	0.0	3.1	0.0
Luang Namtha	1.3	99.6	0.0	0.4	1.3	0.0
Oudomxai	1,575.3	99.0	15.1	1.0	1,590.4	4.2
Bokeo	1,081.0	99.7	3.0	0.3	1,084.0	2.9
Luang Prabang	7,296.5	99.9	7.0	0.1	7,303.5	19.3
Houaphan	25.5	100.0	0.0	0.0	25.5	0.1
Xayabouly	12,798.2	100.0	0.7	0.0	12,798.9	33.8
Xiengkhouang	1.8	85.7	0.3	14.3	2.1	0.0
Vientiane	14,876.8	99.9	7.5	0.1	14,884.3	39.4
Bolikhamxai	0.0	0.0	0.6	100.0	0.6	0.0
Khammouan	1.7	99.4	0.0	0.6	1.7	0.0
Savannakhet	0.5	99.0	0.0	1.0	0.5	0.0
Salavan	0.0	66.7	0.0	33.3	0.1	0.0
Xekong	0.0	66.7	0.0	33.3	0.0	0.0
Champasak	2.0	98.5	0.0	1.5	2.0	0.0
Attapeu	0.0	55.6	0.0	44.4	0.0	0.0
Total	**37,777.8**	**99.9**	**34.3**	**0.1**	**37,812.1**	**100.0**


0E
200000E
400000E
600000E
2400000N
2200000N
2000000N
1800000N
1600000N
22°0'N
20°0'N
18°0'N
16°0'N
14°0'N
102°0'E
104°0'E
106°0'E
CHINA
VIETNAM
MYANMAR
THAILAND
CAMBODIA
Percentage of agricultural land under Job's tears at village level (8643)
0 % (7423)
> 0 - 1 % (474)
> 1 - 5 % (272)
> 5 - 10 % (100)
> 10 - 30 % (193)
> 30 - 78 % (181)
Total number of households (colour) and area planted (size) at district level
Wet season
Dry season
10000 ha
5000 ha
2000 ha
500 ha
Not shown < 10 ha
Labeled > 500 ha
> 1 - 5 households
> 5 - 100 households
> 100 - 1000 households
> 1000 - 2000 households
> 2000 - 5159 households
Phongsaly
Luang Namtha
Muang Xay
550ha
Huay Xay
1050ha
990ha
3100ha
2360ha
820ha
Luang Prabang
1340ha
950ha
Xamneua
Phonsavan
Xayabouly
3390ha
1260ha
1110ha
1030ha
1720ha
1890ha
2640ha
1031 0ha
Viengkham
Vientiane
Paksanh
Thakhek
Savannakhet
Salavan
Xekong
Pakxe
Attapeu
0 50 100 150 km
Average area under Job's tears per producing household at district level (143)
0.0 ha / hh (59)
> 0.0 - 0.1 ha / hh (37)
> 0.1 - 0.5 ha / hh (20)
> 0.5 - 1.0 ha / hh (18)
> 1.0 - 2.0 ha / hh (8)
> 2.0 - 6.0 ha / hh (1)
0 100 200 300 km
PHONGSALY
LUANG NAMTHA
BOKEO
OUDOMXAI
LUANG PRABANG
HOUAPHAN
XAYABOULY
XIENGKHOUANG
VIENTIANE PROVINCE
VIENTIANE CAPITAL
BOLIKHAMXAI
KHAMMOUAN
SAVANNAKHET
SALAVAN
XEKONG
CHAMPASAK
ATTAPEU

C13 Cassava

Introduction

Cassava (*Manihot esculenta*) starch is the most widely traded of all native starches worldwide and has a diversity of functions which make it a key input for a range of both food and non-food products. Cassava starch is used in many products including paper, pharmaceuticals, textiles, bioplastics and pet food. In addition to the uses of cassava starch, dried cassava chips are used as livestock feed and as a feedstock for ethanol production. Cassava starch is derived from cassava roots grown by many smallholder farmers in Southeast Asia. Finally, cassava remains an important food crop for some upland communities in Southeast Asia. With its combined applications, demand for cassava is likely to increase in the future.

In recent years, cassava has been promoted as a commercial crop by traders coming to the Lao PDR from neighbouring countries. Cassava is a tuber root crop and it ranks third after rice and maize in terms of the total area under cultivation nationally (FAO, 2014).

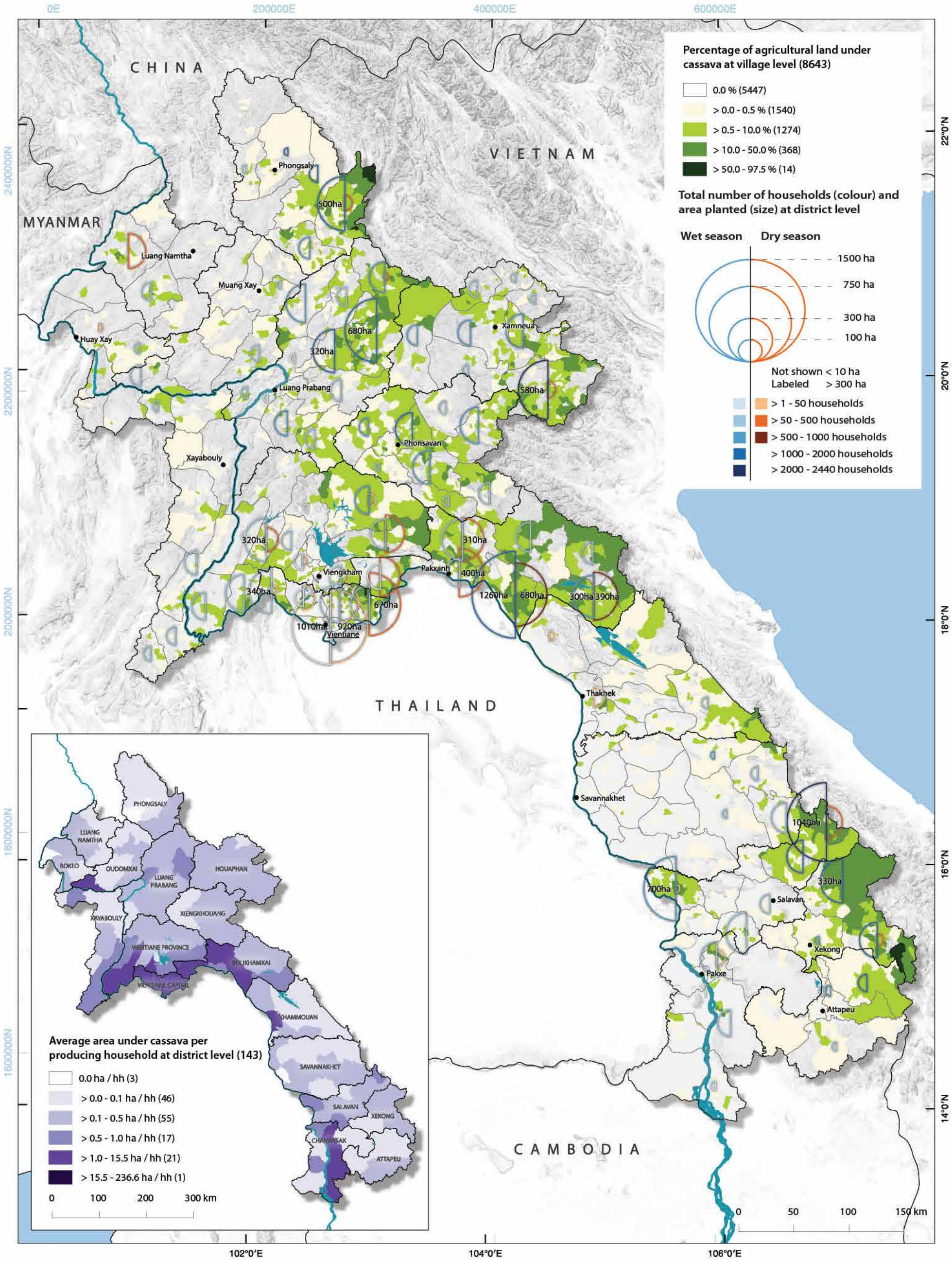
Patterns of cassava cultivation in 2011

Cassava is, with 18,950 ha, a widely grown cash and food crop in the Lao PDR. A total of 3,196 villages (37 percent of all villages) grow cassava nationally, though most on a relatively small amount of their total agricultural land. 2,814 or 88 percent of producing villages use less than 10 percent of their agricultural land for cassava. Most of the 382 villages (the other 12 percent of producing villages) which devote a larger portion of their land to cassava are located along the eastern border with Vietnam.

Cassava is grown in both the wet and dry season, though 73 percent of the area under cassava is grown in the wet season and only 27 percent is grown in the dry season. The districts with cassava cultivation in the dry season are predominantly located alongside the Mekong River, from Vientiane Capital to Bolikhamxai. In Vientiane Capital, as the only of all 17 provinces, the area devoted to cassava cultivation is in the dry season greater than in the wet season, with 1,949 and 1,895 ha respectively.

In Vientiane Capital, there are 3,844 ha planted by only 896 households (an average of 4.2 ha per producing household), thus there are far fewer households involved in cassava production than in other provinces. In Savannakhet Province, in contrast, only 232 ha are grown by 1,760 households making the average only 0.1 ha per household. In Bolikhamxai, where 23 percent (4,377 ha) of the total cassava area of the entire country is planted, the average area per household is 0.84 ha.

As is also observed in other crops like peanut or sugarcane (see C14 and C16), the average area per producing household in Phongsaly Province is lower than in other provinces. A small area of cassava (700 ha) is cultivated in Phongsaly, but the total number of households growing cassava in both the wet and dry season is 5,339 which is very high in comparison to other provinces.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102°0'E
104°0'E
106°0'E
CHINA
VIETNAM
MYANMAR
THAILAND
CAMBODIA
Percentage of agricultural land under cassava at village level (8643)
0.0 % (5447)
> 0.0 - 0.5 % (1540)
> 0.5 - 10.0 % (1274)
> 10.0 - 50.0 % (368)
> 50.0 - 97.5 % (14)
Total number of households (colour) and area planted (size) at district level
Wet season
Dry season
1500 ha
750 ha
300 ha
100 ha
Not shown < 10 ha
Labeled > 300 ha
> 1 - 50 households
> 50 - 500 households
> 500 - 1000 households
> 1000 - 2000 households
> 2000 - 2440 households
Phongsaly
Luang Namtha
Muang Xay
Huay Xay
Luang Prabang
Xamneua
Xayabouly
Phonsavan
Viengkham
Vientiane
Paksane
Thakhek
Savannakhet
Salavan
Xekong
Pakxe
Attapeu
500ha
680ha
320ha
580ha
320ha
310ha
400ha
340ha
670ha
1010ha
920ha
1260ha
680ha
300ha
390ha
1040ha
700ha
330ha
0 100 200 300 km
0 50 100 150 km
Average area under cassava per producing household at district level (143)
0.0 ha / hh (3)
> 0.0 - 0.1 ha / hh (46)
> 0.1 - 0.5 ha / hh (55)
> 0.5 - 1.0 ha / hh (17)
> 1.0 - 15.5 ha / hh (21)
> 15.5 - 236.6 ha / hh (1)
PHONGSALY
LUANG NAMTHA
BOKEO
OUDOMXAI
LUANG PRABANG
HOUAPHAN
XIENGKHOUANG
XAYABOULY
VIENTIANE PROVINCE
BOLIKHAMXAI
VIENTIANE CAPITAL
KHAMMOUAN
SAVANNAKHET
SALAVAN
XEKONG
CHAMPASAK
ATTAPEU

Changes in cassava cultivation patterns between 1999 and 2011

The total area devoted to cassava decreased from 24,800 ha to 18,950 ha between 1999 and 2011. Houaphan Province experienced the most significant decline, as cassava has been widely replaced by maize production (see C11). This was largely pushed by huge market demand for maize from Vietnam. Vietnamese traders provide credit to farmers for purchasing maize seeds and other inputs and make deductions when buying back harvests. Therefore, it is not surprising that the area under cassava declined 90 percent in Houaphan from 11,120 ha in 1999 to 1,120 ha in 2011.

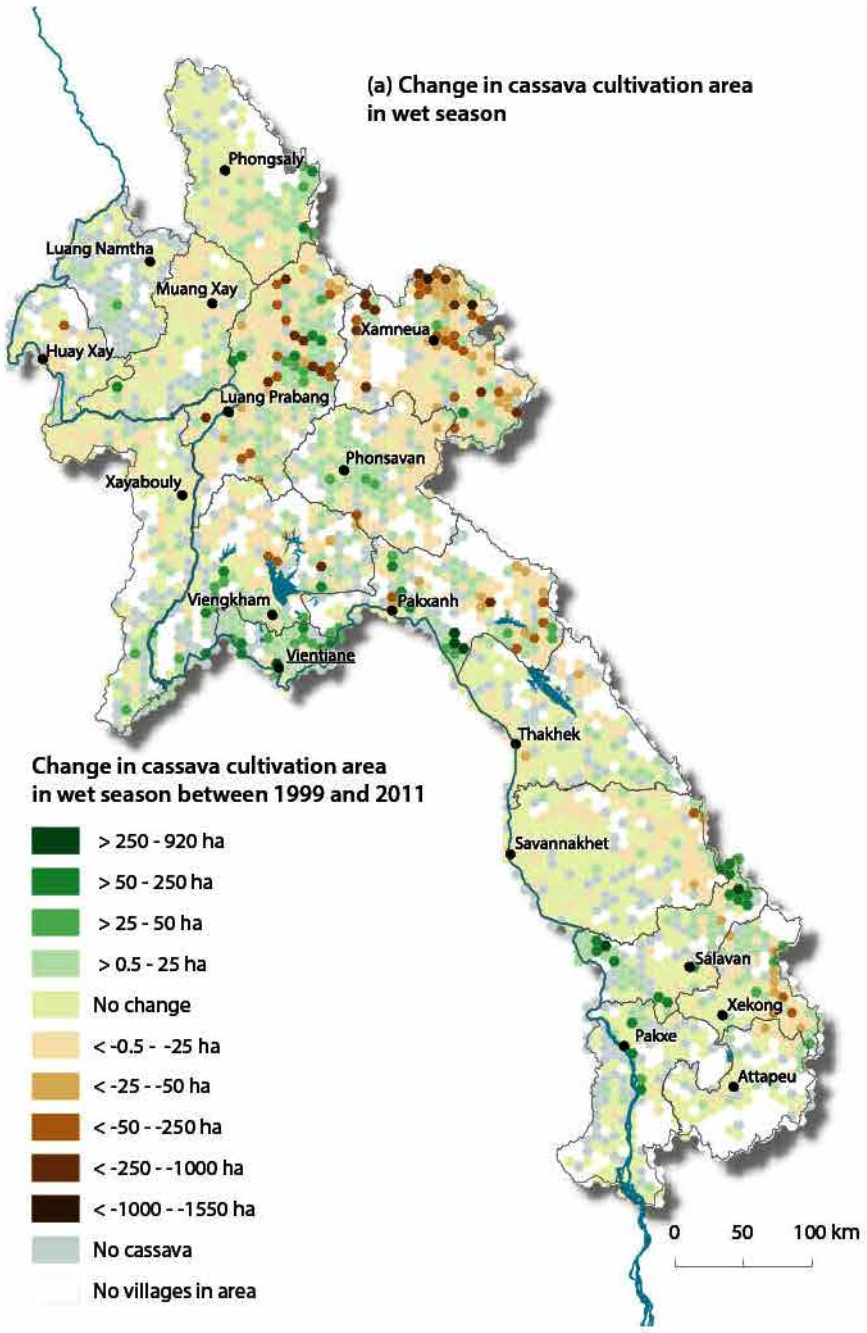
Similar trends are also found in Luang Prabang and Xekong Provinces, but not so drastically as in Houaphan. In Luang Prabang, the area under cassava decreased from 6,230 ha in 1999 to 1,800 ha in 2011. During the same period, around half of the previous cassava production area was left uncultivated in Xekong Province, while other cassava cultivation areas were replaced with coffee (see C21).

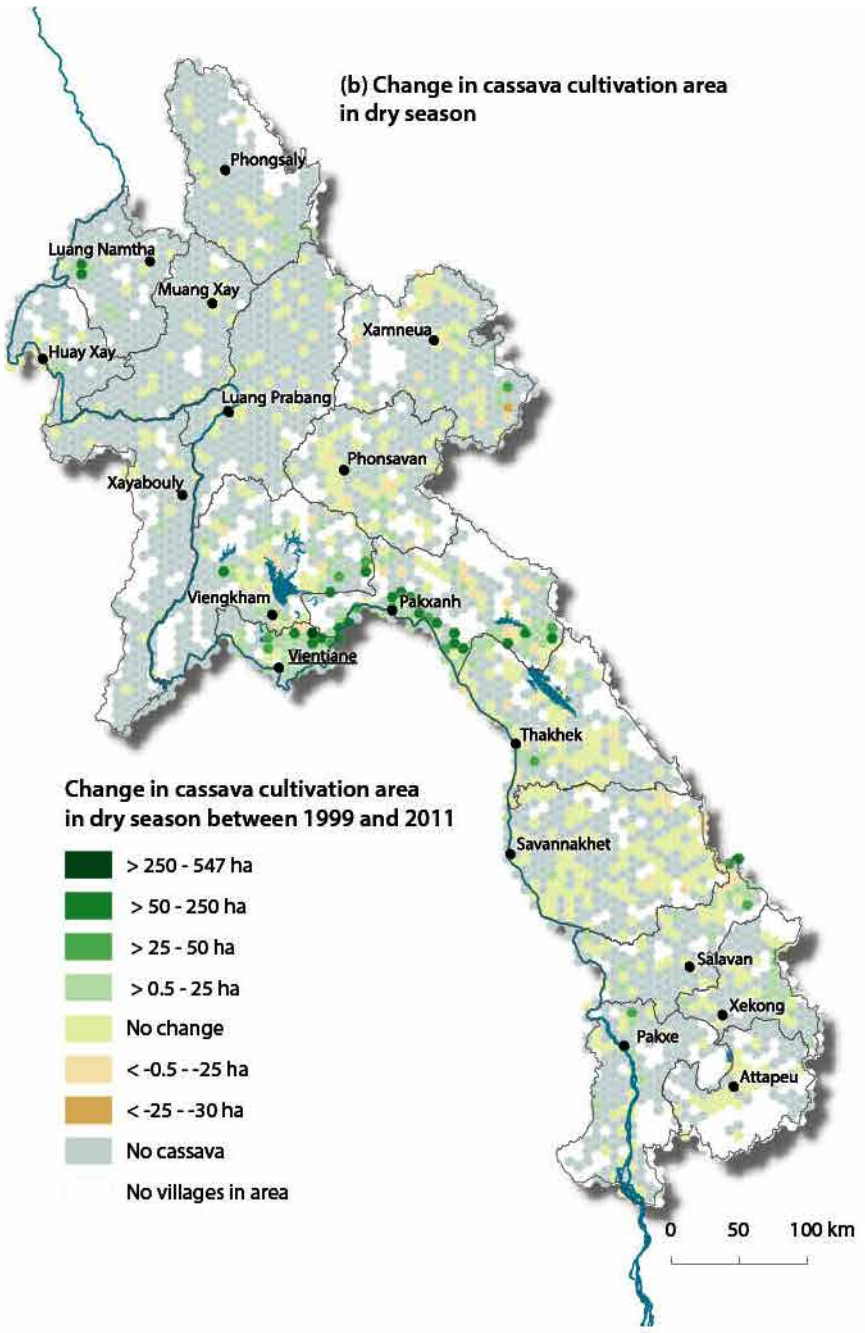
In contrast, in other provinces where market demand is stronger, the area under cassava increased rapidly. This includes Vientiane Capital, Bolikhamxai and Salavan. In Vientiane Capital, the cassava area increased from 50 ha in 1999 to 3,844 ha in 2011; from 1,840 ha to 4,380 ha in Bolikhamxai Province, and from 460 ha to 2,470 ha in Salavan Province during the same period.

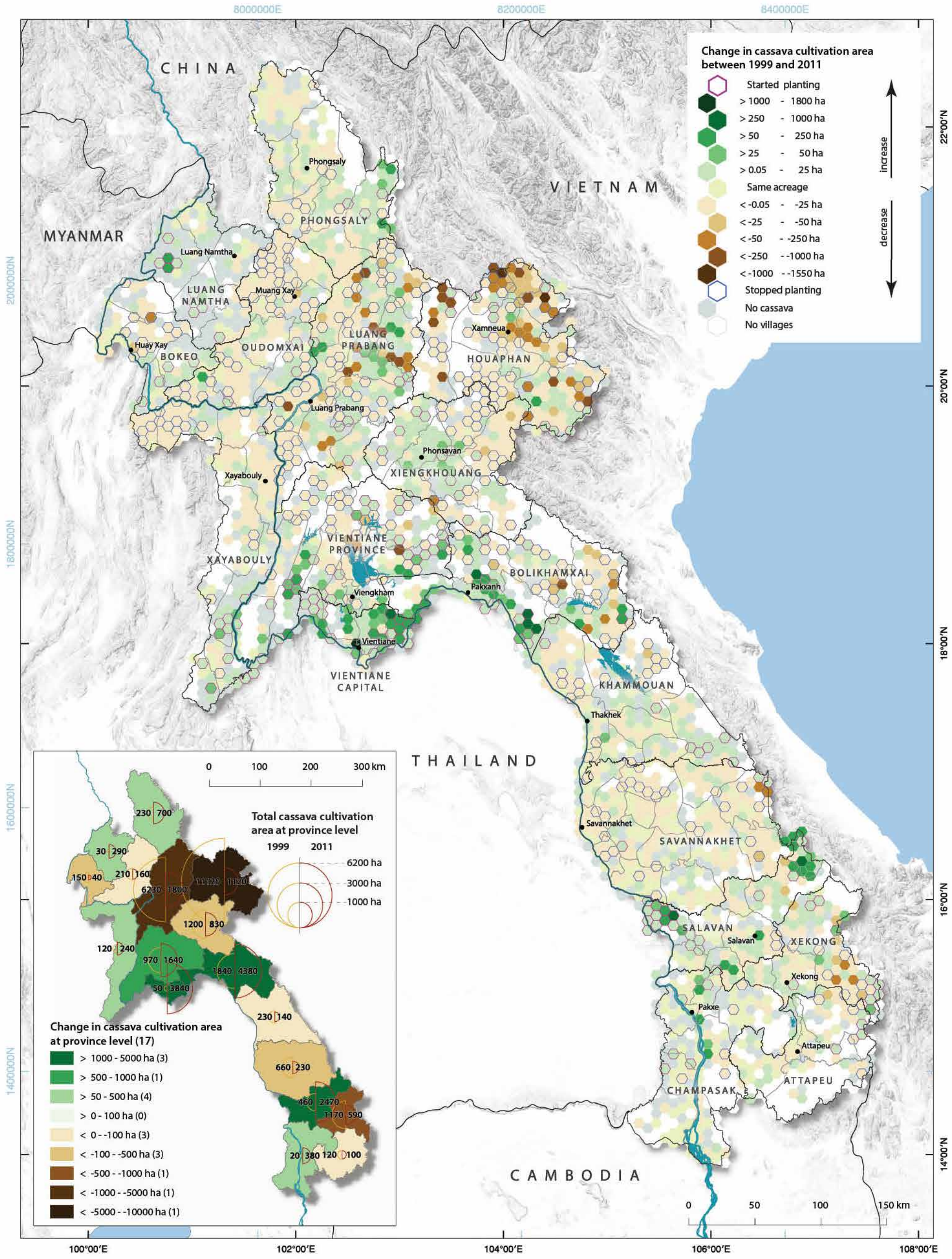
Interpretations

Cassava produced in Vientiane Capital, Vientiane Province and Bolikhamxai is mainly sold to the Lao Indochina starch factory located in the suburbs of Vientiane Capital. Other provinces export dry chips to Thailand and Vietnam. The key push factors for cassava production in the Lao PDR are market demand related: high prices offered by Chinese, Thai and Vietnamese markets, and the increase in dry starch factories in the country requiring dry cassava chips, which are used in feed production. The largest feed mill in the country is CP Laos, a subsidiary of CP Thailand, which is the largest producer of animal feed in Asia. CP took over the Ban Thangon Feed Mill in 2009. The mill needed more than 4,000 tons of dried chips annually to run the factory at full capacity, but it was reported that the factory confronted difficulties obtaining sufficient cassava chips in 2011.

Instability in the cassava market in the past decade has created concerns and impacted smallholders' livelihoods in the Lao PDR and in many countries in Southeast Asia. One of the key factors affecting the cassava production chain was a set of protective policies launched in many neighbouring countries in the past years to protect their own farmers, e.g. price supports in China and quarantine or quality controls by Thai government. These led to drops in demand for intermediate cassava products and led to declining cassava root prices. Finally, farmers in the Lao PDR have suffered from low farm gate prices caused by high transportation costs.






Change in cassava cultivation area between 1999 and 2011
Started planting
> 1000 - 1800 ha
> 250 - 1000 ha
> 50 - 250 ha
> 25 - 50 ha
> 0.05 - 25 ha
Same acreage
< -0.05 - -25 ha
< -25 - -50 ha
< -50 - -250 ha
< -250 - -1000 ha
< -1000 - -1550 ha
Stopped planting
No cassava
No villages
increase
decrease
CHINA
MYANMAR
VIETNAM
THAILAND
CAMBODIA
PHONGSALY
LUANG NAMTHA
OUDOMXAI
BOKEO
LUANG PRABANG
HOUAPHAN
XIENGKHOUANG
XAYABOULY
VIENTIANE PROVINCE
VIENTIANE CAPITAL
BOLIKHAMXAI
KHAMMOUAN
SAVANNAKHET
SALAVAN
XEKONG
CHAMPASAK
ATTAPEU
Phongsaly
Luang Namtha
Muang Xay
Huay Xay
Luang Prabang
Xamneua
Phonsavan
Xayabouly
Viengkham
Vientiane
Pakxanh
Thakhek
Savannakhet
Salavan
Xekong
Pakxe
Attapeu
0 100 200 300 km
Total cassava cultivation area at province level
1999 2011
6200 ha
3000 ha
1000 ha
230 700
30 290
150 40
210 160
6230 1800
11120 1120
1200 830
120 240
970 1640
1840 4380
50 3840
230 140
660 230
460 2470
1170 590
20 380 120 100
Change in cassava cultivation area at province level (17)
> 1000 - 5000 ha (3)
> 500 - 1000 ha (1)
> 50 - 500 ha (4)
> 0 - 100 ha (0)
< 0 - -100 ha (3)
< -100 - -500 ha (3)
< -500 - -1000 ha (1)
< -1000 - -5000 ha (1)
< -5000 - -10000 ha (1)
0 50 100 150 km
8000000E
8200000E
8400000E
2000000N
1800000N
1600000N
1400000N
22°00'N
20°00'N
18°00'N
16°00'N
14°00'N
100°00'E
102°00'E
104°00'E
106°00'E
108°00'E

C14 Peanut

Introduction

Peanut (*Arachis hypogaea*), also known as the groundnut, is a legume and belongs to the Papilionaceae family. Peanuts are widely grown in the tropics and subtropics for local consumption and commercial production. The global production of peanuts in 2011 totalled 35.9 million tons, of which China produced 45 percent and India produced 16 percent.

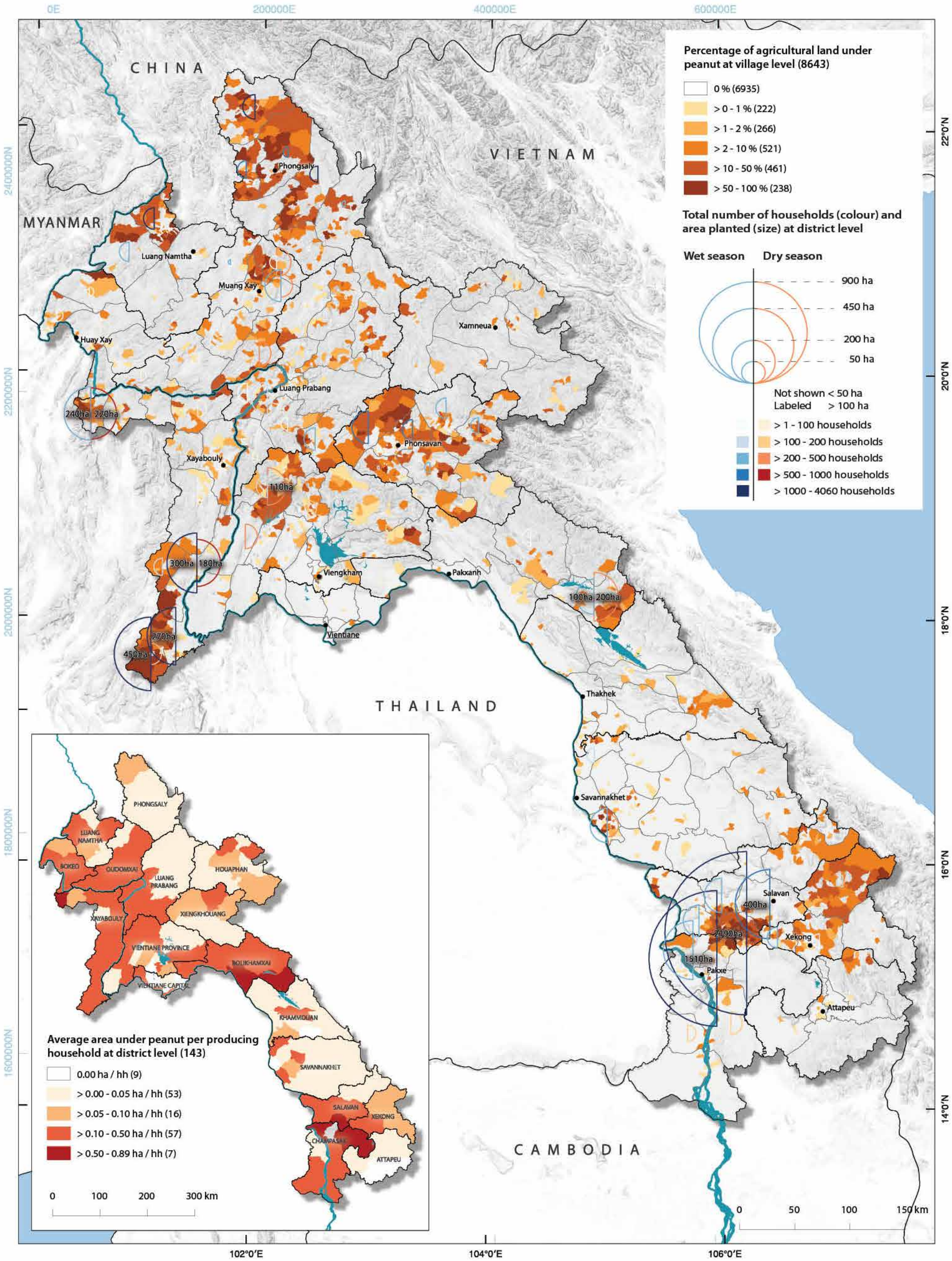
Peanuts are used both for direct consumption in food and snacks and are processed into peanut oil. The production of peanuts in the Lao PDR is mostly for household consumption and for sale to local markets on a relatively small scale. Many farmers grow local varieties of peanuts which are of relatively low productivity compared to newly introduced hybrid peanut seeds. These are sold in local markets throughout the country, often in small quantities, and are sold fresh, ground, dried, and shelled, without quality control. Peanuts grown for export are sold to markets in China, Vietnam and Thailand.

Patterns of peanut cultivation in 2011

Peanut cultivation in the Lao PDR is spread across 1,708 villages (20 percent of all agricultural villages), and is engaged in by more than 30,000 households. Only 238 villages (3 percent) use more than 50 percent of their agricultural land for peanut production, while 461 villages (5 percent) devote 10 - 50 percent of their agricultural land to peanut cultivation. A total of 8,300 ha is planted, of which more than half is located in the south in Salavan, Xekong, Champasak and Attapeu Provinces. In the north, peanut cultivation accounts for 2,552 ha, and very little is planted in central Lao PDR (984 ha).

Peanut production is often concentrated in clusters. Laongam and Bachiangchaleunsouk Districts, located in the north of the Bolaven Plateau between Pakxe and Salavan town, stand out for peanut production. They have 2,190 ha and 1,510 ha of peanuts planted in the two districts respectively, which accounts for nearly half of the total production area in 2011. Another cluster of peanut planting is in southern Xayabouly Province near the Thai border. In this area, more than 1,000 ha of land is under peanut production across three districts (namely in Boten, Kenthao and Paklai), mostly planted during the wet season (see C10). Peanut production in Xiengkhouang Province is also notable, especially in Phoukout District, west of the province capital Phonsavan, where many villages use considerable portions of their agricultural land for peanut production.

The small inset map depicts the average area per household under peanut cultivation at district level. In southern Salavan, northern Champasak, and southern Bolikhamxai, the average household area is between 0.50 and 0.89 ha. Interestingly, production in Phongsaly Province only constitutes 1 - 2 percent of the total production area of peanuts in the Lao PDR, but 15 percent of households in Phongsaly are involved in peanut cultivation (see C13, C16 and C17).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14°0'N
102°0'E
104°0'E
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CHINA
VIETNAM
MYANMAR
THAILAND
CAMBODIA
Phongsaly
Luang Namtha
Muang Xay
Huay Xay
Xamneua
Luang Prabang
Phonsavan
Xayabouly
Viengkham
Pakxanh
Vientiane
Thakhek
Savannakhet
Salavan
Xekong
Pakxe
Attapeu
240ha
220ha
110ha
300ha
180ha
270ha
450ha
100ha
200ha
400ha
2190ha
1510ha
Percentage of agricultural land under peanut at village level (8643)
0 % (6935)
> 0 - 1 % (222)
> 1 - 2 % (266)
> 2 - 10 % (521)
> 10 - 50 % (461)
> 50 - 100 % (238)
Total number of households (colour) and area planted (size) at district level
Wet season
Dry season
900 ha
450 ha
200 ha
50 ha
Not shown < 50 ha
Labeled > 100 ha
> 1 - 100 households
> 100 - 200 households
> 200 - 500 households
> 500 - 1000 households
> 1000 - 4060 households
0 50 100 150 km
PHONGSALY
LUANG NAMTHA
BOKEO
OUDOMXAI
LUANG PRABANG
HOUAPHAN
XAYABOULY
XIENGKHOUANG
VIENTIANE PROVINCE
BOLIKHAMXAI
VIENTIANE CAPITAL
KHAMMOUAN
SAVANNAKHET
SALAVAN
XEKONG
CHAMPASAK
ATTAPEU
Average area under peanut per producing household at district level (143)
0.00 ha / hh (9)
> 0.00 - 0.05 ha / hh (53)
> 0.05 - 0.10 ha / hh (16)
> 0.10 - 0.50 ha / hh (57)
> 0.50 - 0.89 ha / hh (7)
0 100 200 300 km

Changes in peanut cultivation patterns between 1999 and 2011

The total peanut cultivation area declined by more than 7,600 ha (92 percent) between 1999 and 2011 from 15,973 ha to 8,300 ha. Production dropped in both seasons from 10,542 ha to 6,942 ha in the wet season and from 5,433 ha to 4,075 ha in the dry season. Luang Prabang and Xayabouly Provinces experienced a marked decline in the agricultural land under peanut production of 5,837 ha and 2,969 ha respectively.

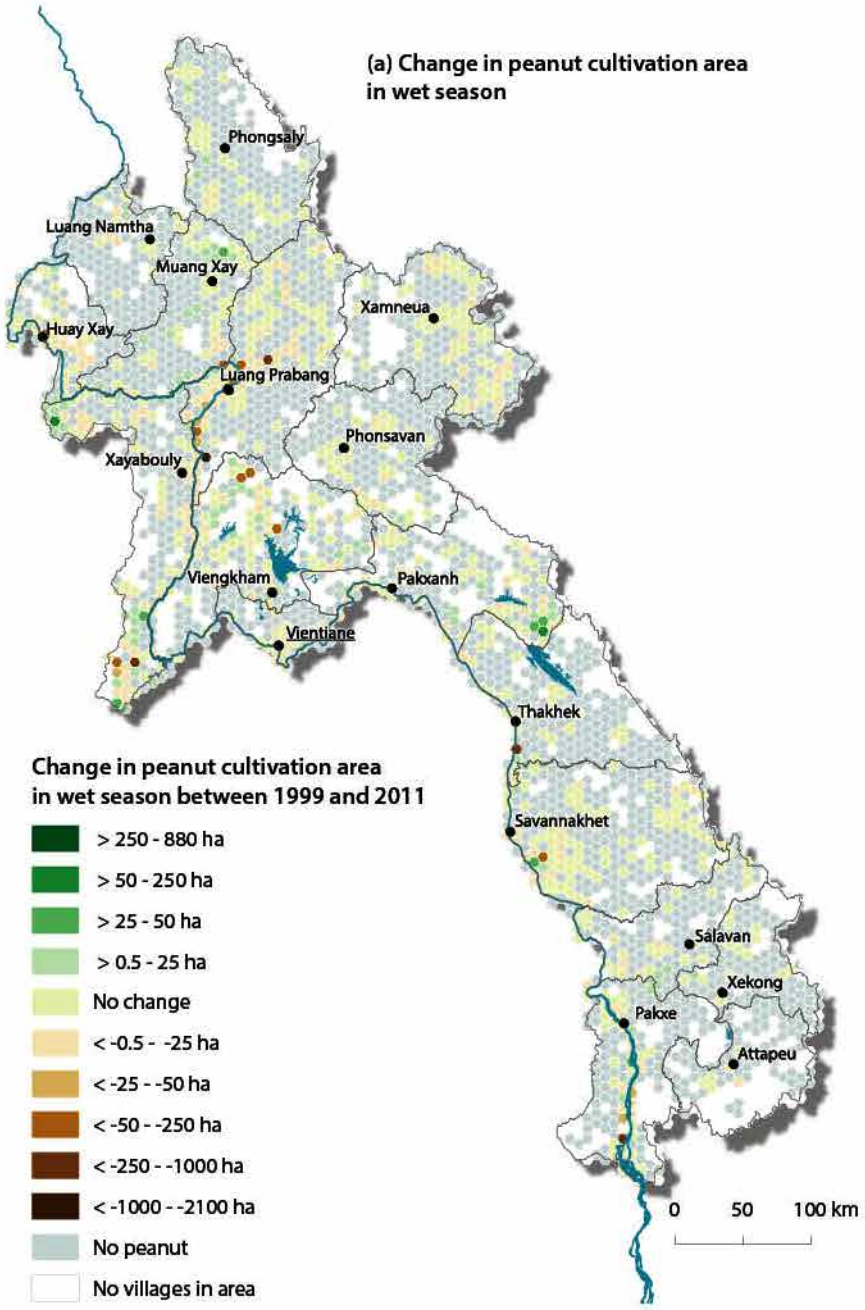
The main map further reveals that, in west and southwest Luang Prabang Province and in southern Xayabouly Province, the area dedicated to peanut declined significantly. In contrast, the region north of the Bolaven Plateau increased its peanut cultivation area. Also in Khamkeut District in Bolikhamxai Province, peanut production increased from 100 ha in 1999 to more than 300 ha in 2011 of which 200 ha are grown during the dry season. In other regions of the country, change was not as significant.

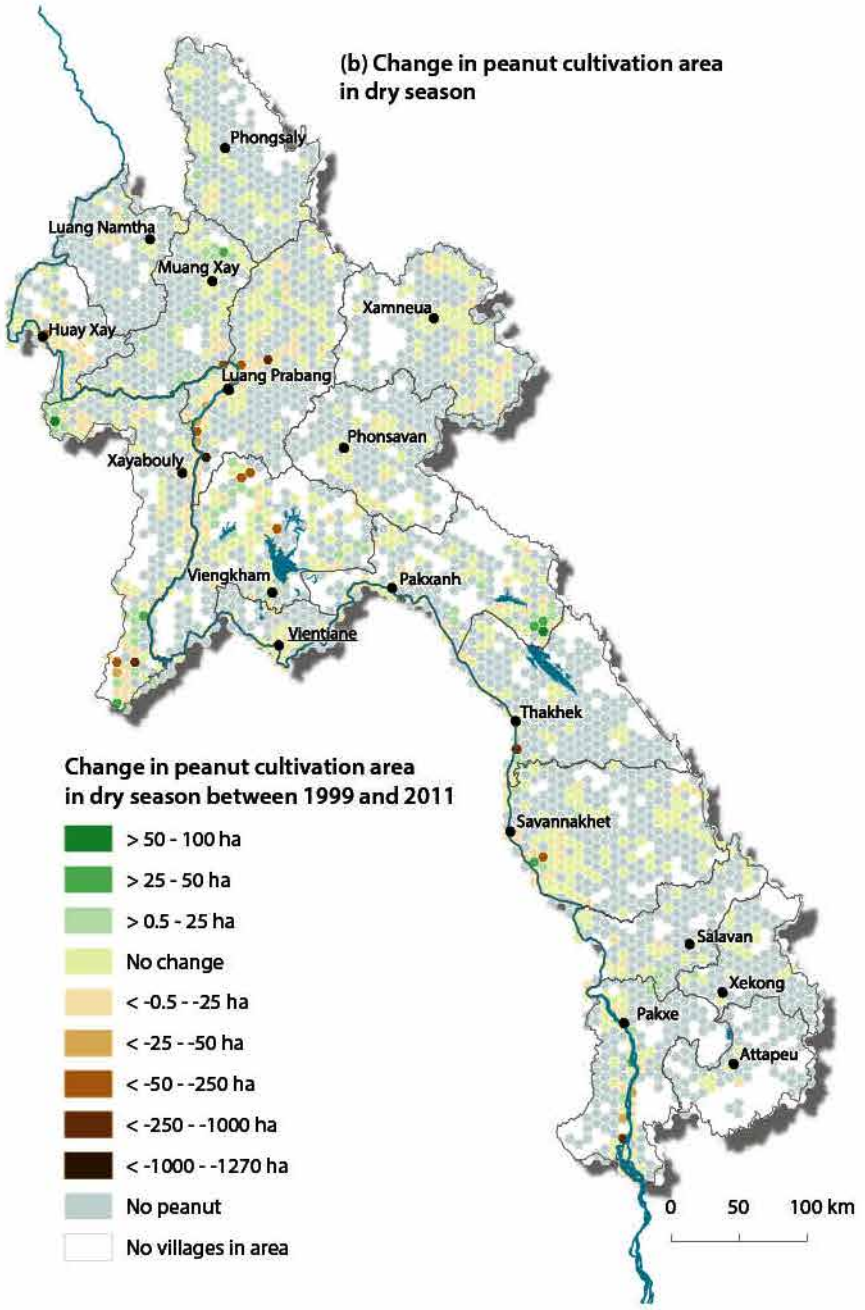
Although the area under peanut production between 1999 and 2011 declined significantly overall, the number of households engaged in peanut production in the wet season increased slightly. 23,981 households were engaged in 1999 and 24,084 in 2011. In the dry season, however, the number of households growing peanuts declined significantly from 10,233 to 5,963 households.

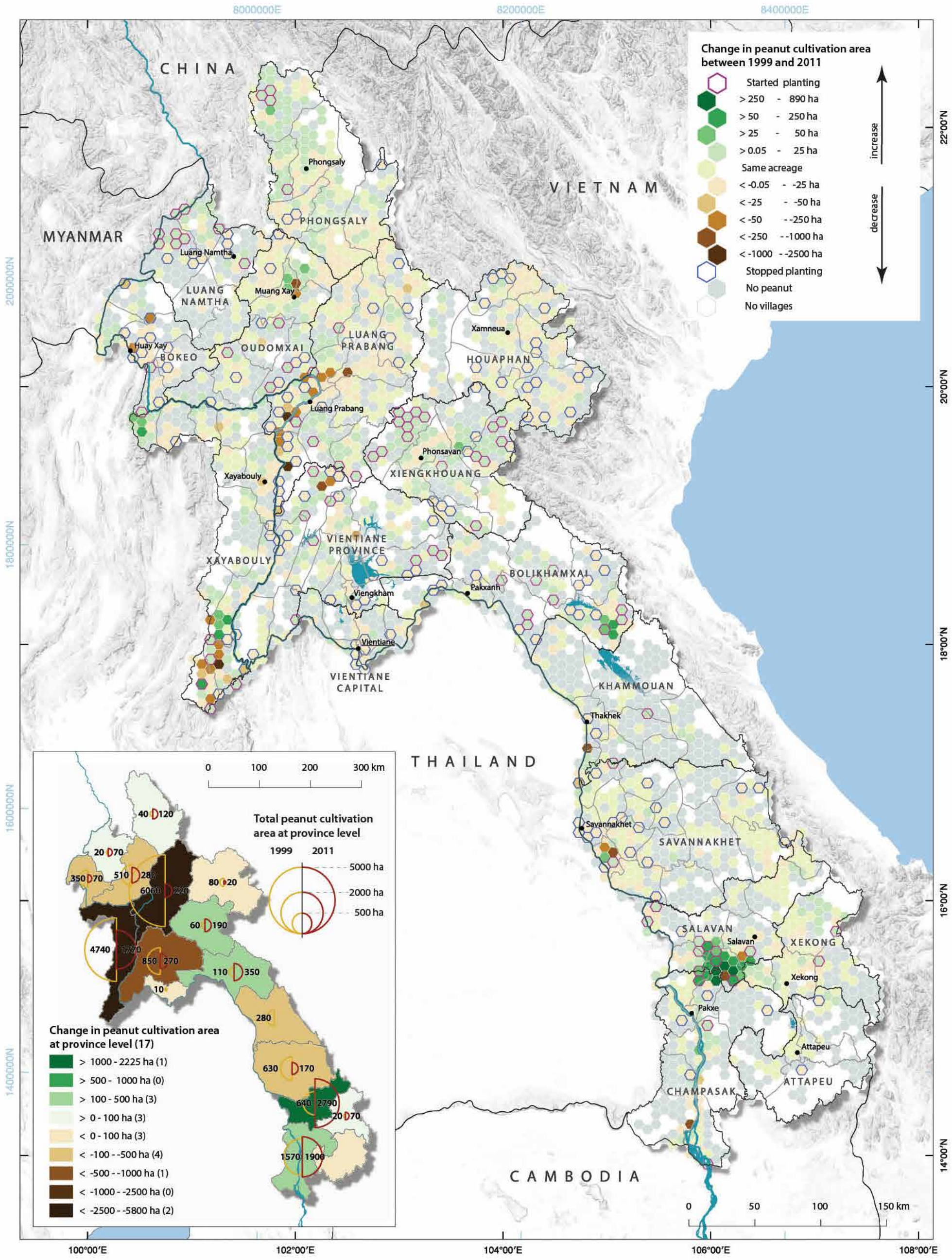
Interpretations

There are several factors contributing to the decline in peanut cultivation area in the Lao PDR between 1999 and 2011. First, Luang Prabang authorities were overly ambitious in using peanut promotion as an alternative to shifting cultivation within their shifting cultivation eradication campaign. Large areas of peanut were established without proper studies of soil suitability and market access for peanuts. Once farmers realized that peanut was not an optimal choice for income generation, they looked for other crops with more stable markets and higher market values.

Second, Chinese and Vietnamese peanuts, introduced recently to the Lao market, have out competed Lao peanuts which are sold at lower prices and in higher quantities. Lao farmers' varying levels of skill and experience in peanut production also play a crucial role in the scale and success of production in many areas. For instance, in the region between Pakxe and Salavan town, peanut production has a long history. With relatively good infrastructure, high soil quality, and close proximity to markets, the conditions for production are better there than in the northern and central provinces.






Change in peanut cultivation area between 1999 and 2011
Started planting
> 250 - 890 ha
> 50 - 250 ha
> 25 - 50 ha
> 0.05 - 25 ha
Same acreage
< -0.05 - -25 ha
< -25 - -50 ha
< -50 - -250 ha
< -250 - -1000 ha
< -1000 - -2500 ha
Stopped planting
No peanut
No villages
increase
decrease
CHINA
MYANMAR
VIETNAM
THAILAND
CAMBODIA
PHONGSALY
LUANG NAMTHA
BOKEO
OUDOMXAI
LUANG PRABANG
HOUAPHAN
XIENGKHOUANG
XAYABOULY
VIENTIANE PROVINCE
VIENTIANE CAPITAL
BOLIKHAMXAI
KHAMMOUAN
SAVANNAKHET
SALAVAN
XEKONG
CHAMPASAK
ATTAPEU
Phongsaly
Luang Namtha
Muang Xay
Huay Xay
Luang Prabang
Xamneua
Phonsavan
Xayabouly
Viengkham
Pakxanh
Vientiane
Thakhek
Savannakhet
Salavan
Xekong
Pakxe
Attapeu
8000000E
8200000E
8400000E
22°00'N
20°00'N
18°00'N
16°00'N
14°00'N
2000000N
1800000N
1600000N
1400000N
100°00'E
102°00'E
104°00'E
106°00'E
108°00'E
0 100 200 300 km
0 50 100 150 km
Total peanut cultivation area at province level
1999 2011
5000 ha
2000 ha
500 ha
40 120
20 70
350 70
510 280
6060 220
80 20
60 190
4740 1770
850 270
110 350
10
280
630 170
640 2790
20 70
1570 1900
Change in peanut cultivation area at province level (17)
> 1000 - 2225 ha (1)
> 500 - 1000 ha (0)
> 100 - 500 ha (3)
> 0 - 100 ha (3)
< 0 - 100 ha (3)
< -100 - -500 ha (4)
< -500 - -1000 ha (1)
< -1000 - -2500 ha (0)
< -2500 - -5800 ha (2)

C15 Soybean

Introduction

The soybean (*Glycine max L.*) is an Asian legume, widely grown for direct human consumption but which can also be processed into a range of other products. It contains essential high proteins for humans and animals and the by-product from soybean oil production, the soybean cake, also contains protein with a high energy and amino acid profile. Soybeans have been grown and consumed in China for more than 5,000 years. Today, soybeans are often produced at large scales in monoculture plantations, mostly in North and South America.

Some Asian countries have a long history of planting soybeans, but in the Lao PDR, soybean cultivation was introduced only recently. Soybean cultivation can be a source of income for local people, who are gradually shifting from traditional production systems aimed at meeting household consumption needs to a more market oriented economy.

Table 3: Total and change of area of soybean between 1999 and 2011

Province	Total ha soybean 1999	Total ha soybean 2011	Change 1999 to 2011
Vientiane Capital	8.2	2.8	-5.4
Phongsaly	1,691.2	148.6	-1,542.6
Luang Namtha	9.2	21.0	11.8
Oudomxai	166.0	468.8	302.8
Bokeo	192.3	35.5	-156.8
Luang Prabang	974.7	417.6	-557.1
Houaphan	3,662.7	190.8	-3,471.9
Xayabouly	59.1	4.3	-54.8
Xiengkhouang	342.3	49.7	-292.6
Vientiane	67.3	2.9	-64.4
Bolikhamxai	13.8	0.9	-12.9
Khammouan	0.0	0.0	0.0
Savannakhet	9.1	0.9	-8.2
Salavan	331.5	122.3	-209.2
Xekong	9.0	0.0	-9.0
Champasak	728.0	439.8	-288.2
Attapeu	24.7	0.0	-24.7
Total	**8,289.0**	**1,906.0**	**-6,383.0**

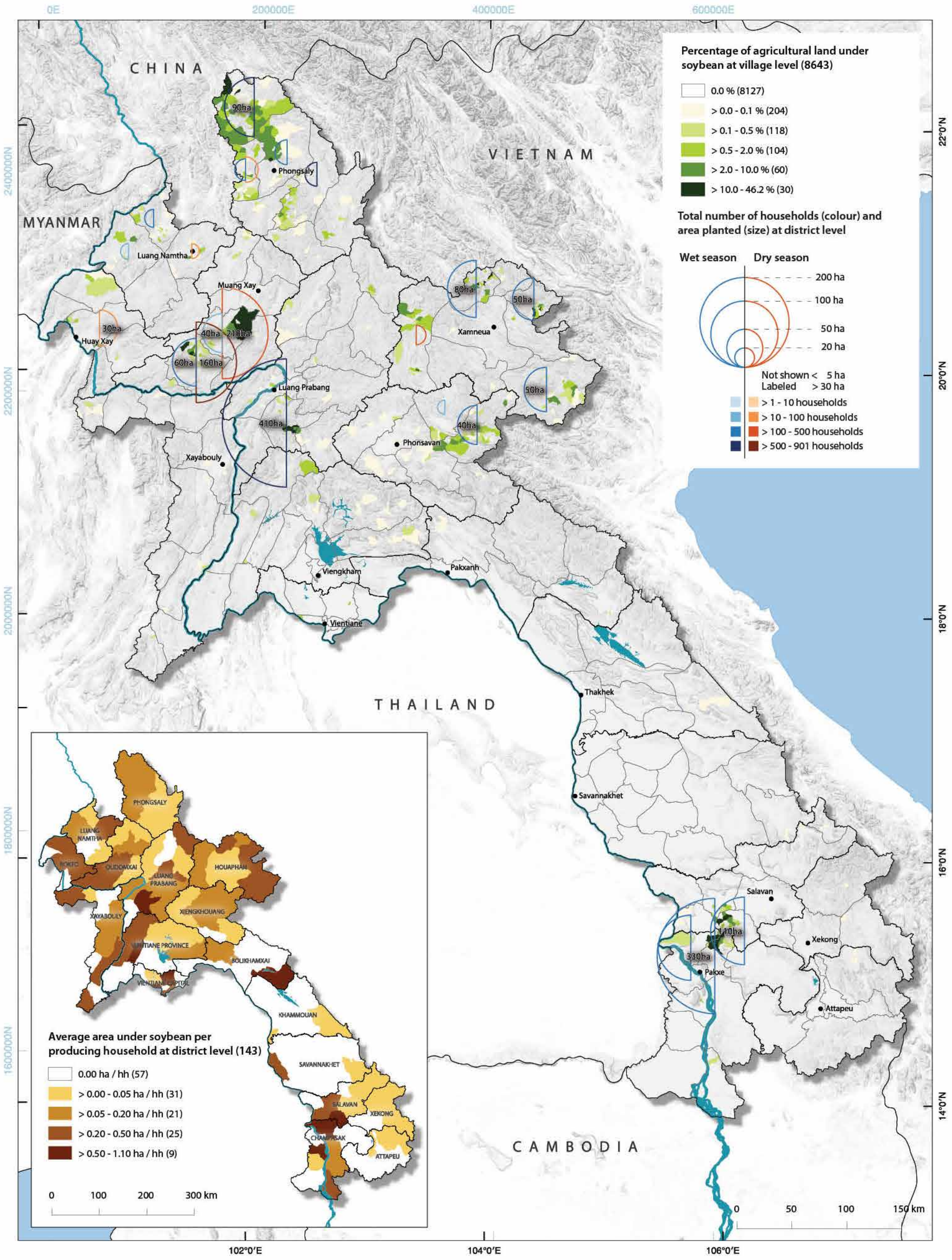
Patterns of soybean cultivation in 2011

Soybeans are produced on 1,906 ha of land in the Lao PDR in 516 villages. Most of these villages use only a small portion of their agricultural land for soybean cultivation. Only 30 villages use more than 10 percent of their land, and the maximum portion of agricultural land under soybeans in a village is 46.2 percent. Thus, soybeans are a relatively underdeveloped annual crop in the Lao PDR.

Around 1,500 ha of soybeans are grown in the wet season on rain-fed fields and approximately 450 ha are grown in the dry season under irrigation, particularly alongside river banks. The spatial distribution of cultivation is fairly scattered, though most villages which grow soybeans are in the north and the few villages that devote more than 10 percent of their total agricultural land to soybeans are located in Phongsaly and Houaphan, central Oudomxai, Xieng-ngeun District in southern Luang Prabang Province, and in the region between Pakxe and Salavan town.

The semicircles on the map show the total area planted and the number of households at district level, for which blue stands for area of soybeans cultivated during wet season and orange stands for dry season. Beng and Houn Districts in Oudomxai, located alongside the Nam Beng River, cultivate 210 ha and 160 ha during dry season respectively. In Beng District, 493 households cultivate soybeans during the dry season (at 0.42 ha/hh), whereas in Houn District, 582 households cultivate soybeans during the dry season (at 0.27 ha/hh). In the wet season, only 40 ha and 60 ha are cultivated in Beng and Houn Districts respectively.

In total, there are 6,856 households engaged in soybean cultivation, which is under 1 percent of all agricultural households in the Lao PDR. In only 9 districts is the average area of soybean production per household over 0.5 ha, whereas the national average is only 0.3 ha per producing household.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18°0'N
16°0'N
14°0'N
102°0'E
104°0'E
106°0'E
CHINA
VIETNAM
MYANMAR
THAILAND
CAMBODIA
Percentage of agricultural land under soybean at village level (8643)
0.0 % (8127)
> 0.0 - 0.1 % (204)
> 0.1 - 0.5 % (118)
> 0.5 - 2.0 % (104)
> 2.0 - 10.0 % (60)
> 10.0 - 46.2 % (30)
Total number of households (colour) and area planted (size) at district level
Wet season
Dry season
200 ha
100 ha
50 ha
20 ha
Not shown < 5 ha
Labeled > 30 ha
> 1 - 10 households
> 10 - 100 households
> 100 - 500 households
> 500 - 901 households
90ha
Phongsaly
Luang Namtha
Muang Xay
30ha
Huay Xay
40ha
210ha
60ha
160ha
Luang Prabang
410ha
Xayabouly
80ha
50ha
Xamneua
50ha
40ha
Phonsavan
Viengkham
Vientiane
Pakxanh
Thakhek
Savannakhet
Salavan
110ha
330ha
Xekong
Paksse
Attapeu
PHONGSALY
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BOKEO
OUDOMXAI
LUANG PRABANG
HOUAPHAN
XAYABOULY
XIENGKHOUANG
VIENTIANE PROVINCE
BOLIKHAMXAI
VIENTIANE CAPITAL
KHAMMOUAN
SAVANNAKHET
SALAVAN
XEKONG
CHAMPASAK
ATTAPEU
Average area under soybean per producing household at district level (143)
0.00 ha / hh (57)
> 0.00 - 0.05 ha / hh (31)
> 0.05 - 0.20 ha / hh (21)
> 0.20 - 0.50 ha / hh (25)
> 0.50 - 1.10 ha / hh (9)
0 100 200 300 km
0 50 100 150 km

Changes in soybean cultivation patterns between 1999 and 2011

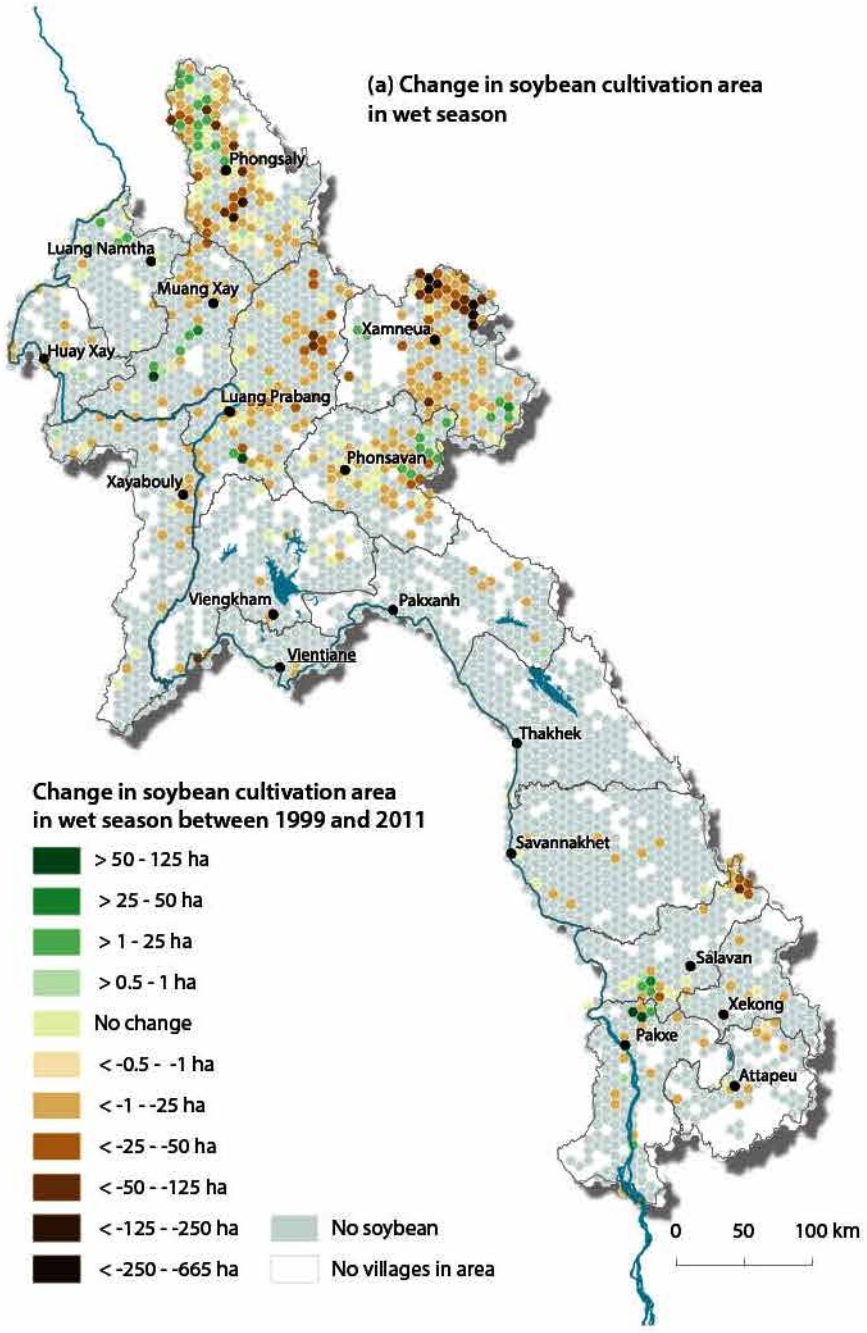
The area under soybean production decreased throughout the country between 1999 and 2011, most significantly in the northern provinces. The area declined 77 percent within a decade - from 8,289 ha in 1999 to 1,906 ha in 2011. In 1999, Houaphan had the highest soybean production area in the country, particularly in the villages bordering Vietnam in the northeast (Et and Xiengkho Districts). By 2011 the production area declined by 3,472 ha while in many regions of Houaphan production stopped entirely. In Phongsaly production declined by a total of 1,543 ha during the same period. This drop in soybean production occurred across the country with the exceptions of Oudomxai and Luang Namtha. The soybean area in Oudomxai, namely in Beng and Houn Districts, increased nearly threefold from 166 ha to 469 ha. Table 3 gives detailed information about soybean area and their changes in 1999 and 2011 at province level.

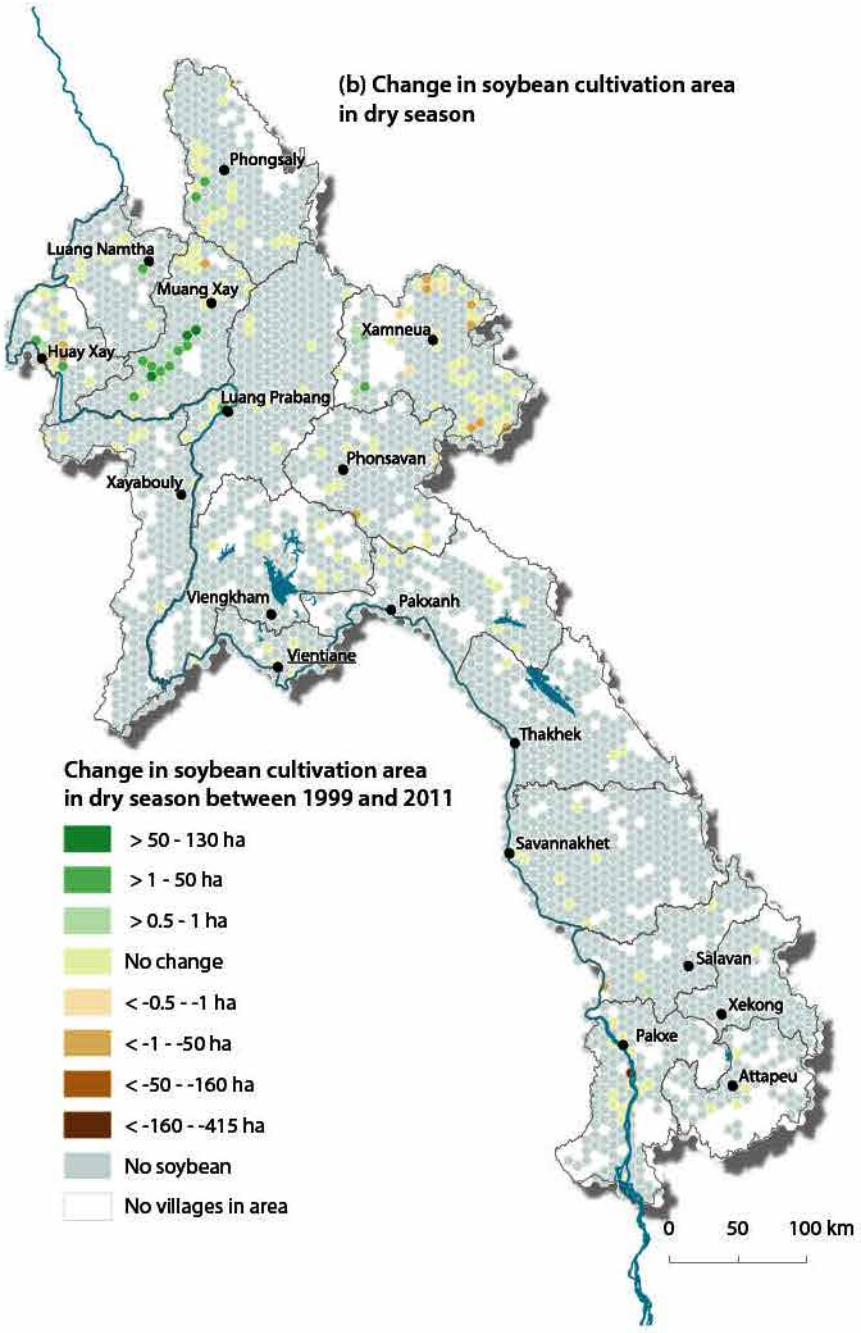
The decline in production area in the wet season was more significant (both relatively and in absolute terms) than that in the dry season. The wet season production area dropped by over 6,000 ha and the dry season area by more than 200 ha. The sharp decline was particularly found in the northern uplands along the borders with Vietnam and China.

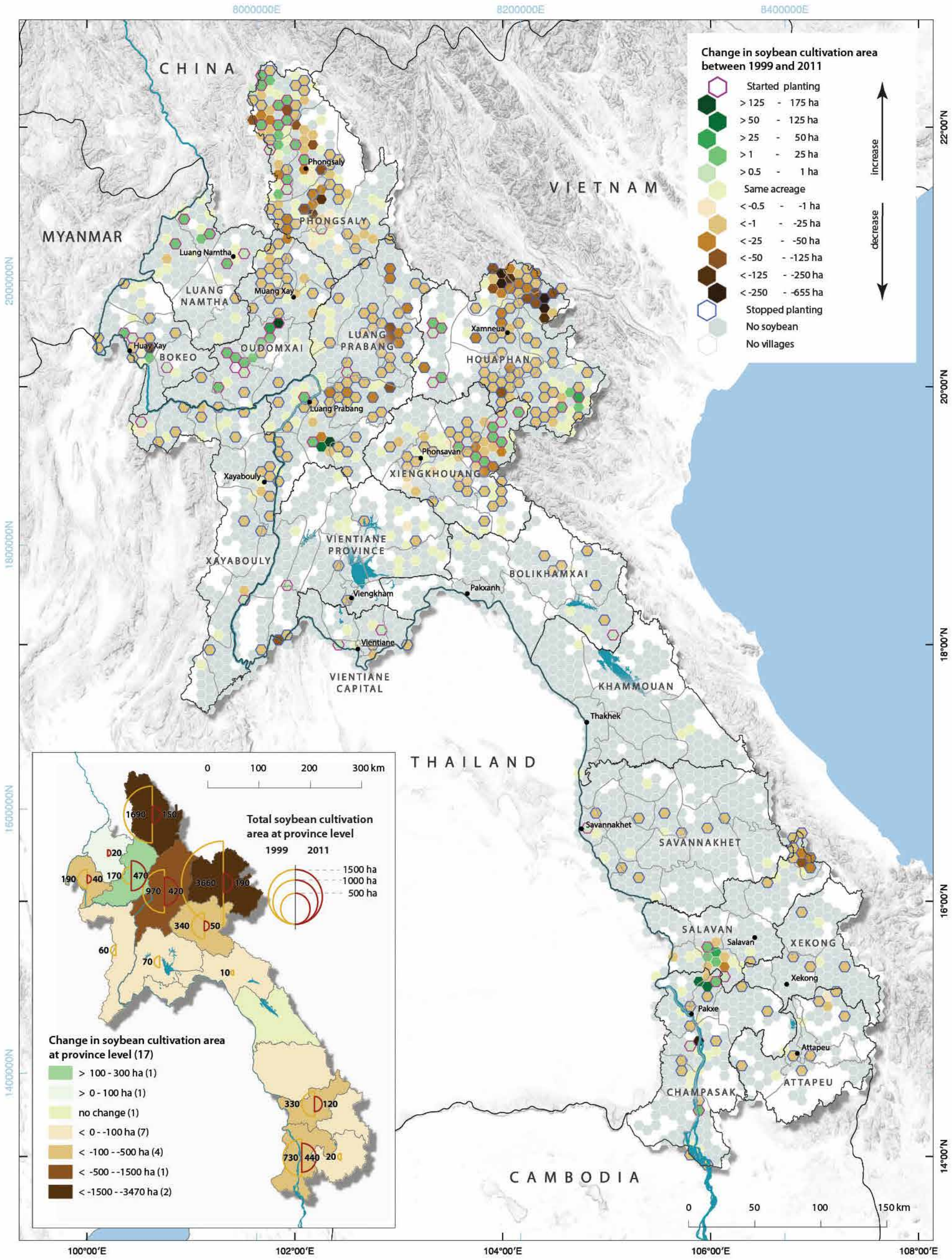
Interpretations

GoL policies play an important role in these changes. In attempting to eradicate opium production and stabilize shifting cultivation practices in northern Lao PDR, soybean was one of the cash crops promoted as an alternative crop that could increase and diversify famers' income sources.

Fluctuating market prices, flagging market demand, and limitations to farmers' existing skills in soybean production, however, were factors leading to the decline in the production area. There has been high market demand from Thailand for soybeans since the 2000s, but significant obstacles have prevented Lao soybeans from entering the Thai market. The scale of production in the Lao PDR was too small to enter that market, transportation costs too high, and productivity per land unit too low due to the use of local varieties and the unpredictability of climate. As a result, Lao farmers' have not been able to compete with bulk industrial suppliers from Brazil and the USA.






8000000E
8200000E
8400000E
2000000N
1800000N
1600000N
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22°00'N
20°00'N
18°00'N
16°00'N
14°00'N
100°00'E
102°00'E
104°00'E
106°00'E
108°00'E
CHINA
MYANMAR
VIETNAM
THAILAND
CAMBODIA
Change in soybean cultivation area between 1999 and 2011
Started planting
> 125 - 175 ha
> 50 - 125 ha
> 25 - 50 ha
> 1 - 25 ha
> 0.5 - 1 ha
Same acreage
< -0.5 - -1 ha
< -1 - -25 ha
< -25 - -50 ha
< -50 - -125 ha
< -125 - -250 ha
< -250 - -655 ha
Stopped planting
No soybean
No villages
increase
decrease
Phongsaly
PHONGSALY
Luang Namtha
LUANG NAMTHA
Muang Xay
Huay Xay
BOKEO
OUDOMXAI
LUANG PRABANG
Luang Prabang
Xamneua
HOUAPHAN
Phonsavan
XIENGKHOUANG
Xayabouly
XAYABOULY
VIENTIANE PROVINCE
Viengkham
Vientiane
VIENTIANE CAPITAL
BOLIKHAMXAI
Pakxanh
KHAMMOUAN
Thakhek
Savannakhet
SAVANNAKHET
SALAVAN
Salavan
XEKONG
Xekong
Pakxe
Attapeu
ATTAPEU
CHAMPASAK
0 100 200 300 km
Total soybean cultivation area at province level
1999 2011
1500 ha
1000 ha
500 ha
1690 150
20
190 40 170 470
970 420 3660 190
340 50
60
70
10
330 120
730 440 20
Change in soybean cultivation area at province level (17)
> 100 - 300 ha (1)
> 0 - 100 ha (1)
no change (1)
< 0 - -100 ha (7)
< -100 - -500 ha (4)
< -500 - -1500 ha (1)
< -1500 - -3470 ha (2)
0 50 100 150 km

C16 Sugarcane

Introduction

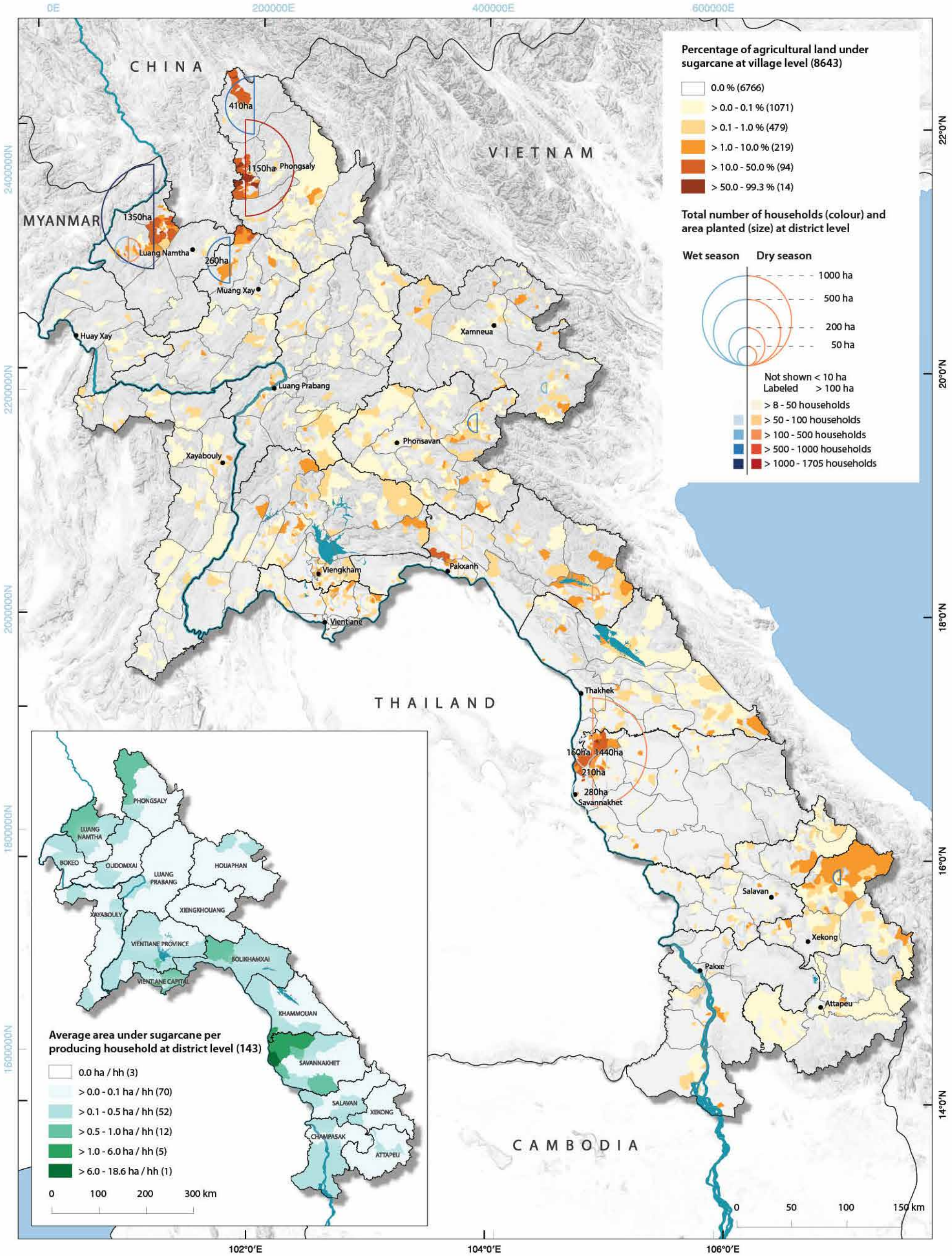
Sugarcane is the common name of several species of the genus *Saccharum* and belongs to the family *Gramineae* or *Poaceae*. The genus *Saccharum* has five important species including *S. officinarum, S. sinense, S. barberi, S. robustum and S. spontaneum.* The first three species are cultivated species and the latter two are wild. Sugarcane is indigenous to India and is a tropical crop requiring a hot climate. However, sugarcane also grows well in subtropical climatic conditions where temperatures range from 20 - 35°C. Sugarcane is a cash crop relatively newly introduced to the Lao PDR by its neighbouring countries seeking new supplies for their growing sugar factories. Currently, Savannakhet Province has the most significant industrial sugarcane sector in the Lao PDR with large-scale plantations employing advanced production approaches and technologies (IUCN and NERI, 2011).

Patterns of sugarcane cultivation in 2011

Sugarcane is grown in the lowlands as well as in the uplands of the Lao PDR during both the wet and dry season. A total of 6,449 ha sugarcane is cultivated, of which 3,155 ha is grown during the wet season and 3,294 ha during the dry season. Among the 1,877 villages that cultivate sugarcane, only 108 use more than 10 percent of their agricultural land, and a mere 14 villages use more than 50 percent of their agricultural land for sugarcane. There are two cluster regions for sugarcane planting: along the Chinese border in Luang Namtha and Phongsaly, and in Savannakhet along the border with Thailand.

Sugarcane is cultivated at significant scales in Sing District, Luang Namtha, in the areas surrounding the district capital. 1,350 ha are grown there by 1,705 households. A smaller but also notable centre of sugarcane production is Namo District in Oudomxai Province with 260 ha cultivated by 562 households in the wet season. Sugarcane is also planted in Bounneua District in Western Phongsaly, where 1,403 households plant 1,150 ha of sugarcane in the dry season, mainly along the many rivers there (e.g. Nam Boun, Nam Nou or Nam Hoy) where water is available. In Gnot-ou, the northernmost district in Phongsaly, 410 ha are grown by 740 households in the wet season. The second sugarcane cluster region is northwest Savannakhet Province, where sugarcane is planted primarily in the dry season. 1,440 ha are grown in Xaibouly District by 260 households and 280 ha in Kaysone Phomvihane District by 13 households. Sugarcane is also grown during the wet season in Savannakhet: 160 ha in Xaibouly by 59 households and 210 ha in Outhoumphon District by 56 households.

The small inset map shows that large scale sugarcane production occurs in northwest Savannakhet Province. In Kaysone Phomvihane District, the average operating area per household is 18.6 ha, and in the four neighbouring districts northeast of that district the averages range from 1.0 - 6.0 ha. In contrast, in Phongsaly and Luang Namtha the average operating area per household is less than 1.0 ha.


0E
200000E
400000E
600000E
2400000N
2200000N
2000000N
1800000N
1600000N
22°0'N
20°0'N
18°0'N
16°0'N
14°0'N
102°0'E
104°0'E
106°0'E
CHINA
VIETNAM
MYANMAR
THAILAND
CAMBODIA
Percentage of agricultural land under sugarcane at village level (8643)
0.0 % (6766)
> 0.0 - 0.1 % (1071)
> 0.1 - 1.0 % (479)
> 1.0 - 10.0 % (219)
> 10.0 - 50.0 % (94)
> 50.0 - 99.3 % (14)
Total number of households (colour) and area planted (size) at district level
Wet season
Dry season
1000 ha
500 ha
200 ha
50 ha
Not shown < 10 ha
Labeled > 100 ha
> 8 - 50 households
> 50 - 100 households
> 100 - 500 households
> 500 - 1000 households
> 1000 - 1705 households
410ha
1150ha
Phongsaly
1350ha
Luang Namtha
260ha
Muang Xay
Huay Xay
Luang Prabang
Xamneua
Phonsavan
Xayabouly
Viengkham
Vientiane
Paksanh
Thakhek
160ha
1440ha
210ha
280ha
Savannakhet
Salavan
Xekong
Paksxe
Attapeu
0 100 200 300 km
0 50 100 150 km
PHONGSALY
LUANG NAMTHA
BOKEO
OUDOMXAI
LUANG PRABANG
HOUAPHAN
XAYABOULY
XIENGKHOUANG
VIENTIANE PROVINCE
BOLIKHAMXAI
VIENTIANE CAPITAL
KHAMMOUAN
SAVANNAKHET
SALAVAN
XEKONG
CHAMPASAK
ATTAPEU
Average area under sugarcane per producing household at district level (143)
0.0 ha / hh (3)
> 0.0 - 0.1 ha / hh (70)
> 0.1 - 0.5 ha / hh (52)
> 0.5 - 1.0 ha / hh (12)
> 1.0 - 6.0 ha / hh (5)
> 6.0 - 18.6 ha / hh (1)

Changes in sugarcane cultivation patterns between 1999 and 2011

The area under sugarcane production decreased only slightly between 1999 and 2011, though the temporal and spatial patterns changed significantly.

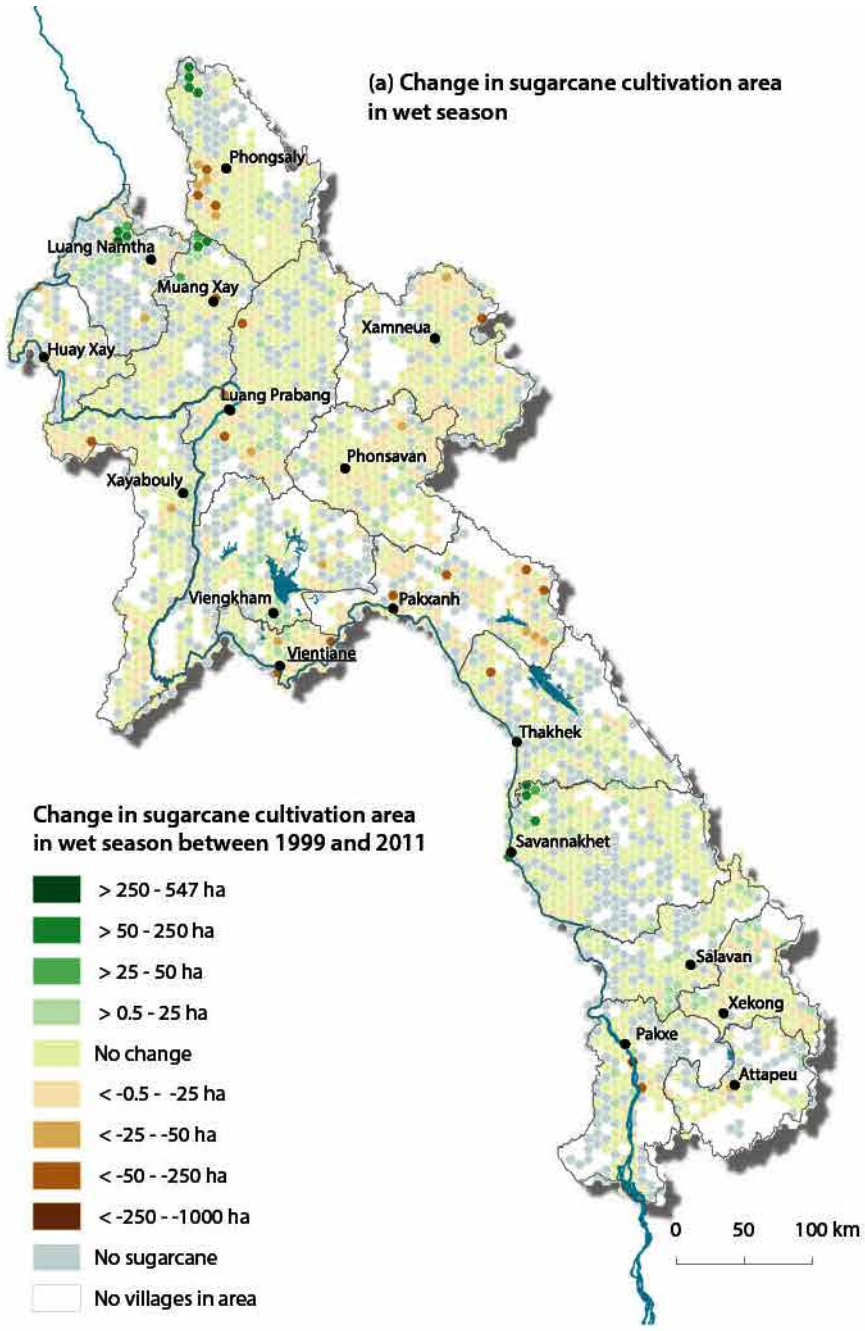
Temporal changes occurred in terms of how much sugarcane is planted in each season. In 1999, 6,057 ha of sugarcane was grown in the wet season compared to only 977 ha in the dry season, whereas in 2011 approximately the same area of sugarcane was cultivated in both seasons (3,155 ha in wet season and 3,294 in dry season). Furthermore, shifts in the spatial distribution of sugarcane production occurred between 1999 and 2011, particularly in Bolikhamxai and to a smaller degree in Khammouan and Champasak where cultivation declined. In contrast, the area under sugarcane in Luang Namtha, Phongsaly and Savannakhet increased. The number of households engaged in sugarcane production nationwide increased by 7,438 households (from 5,715 to 13,153) between 1999 and 2011, with the main areas of increase in northern Laos.

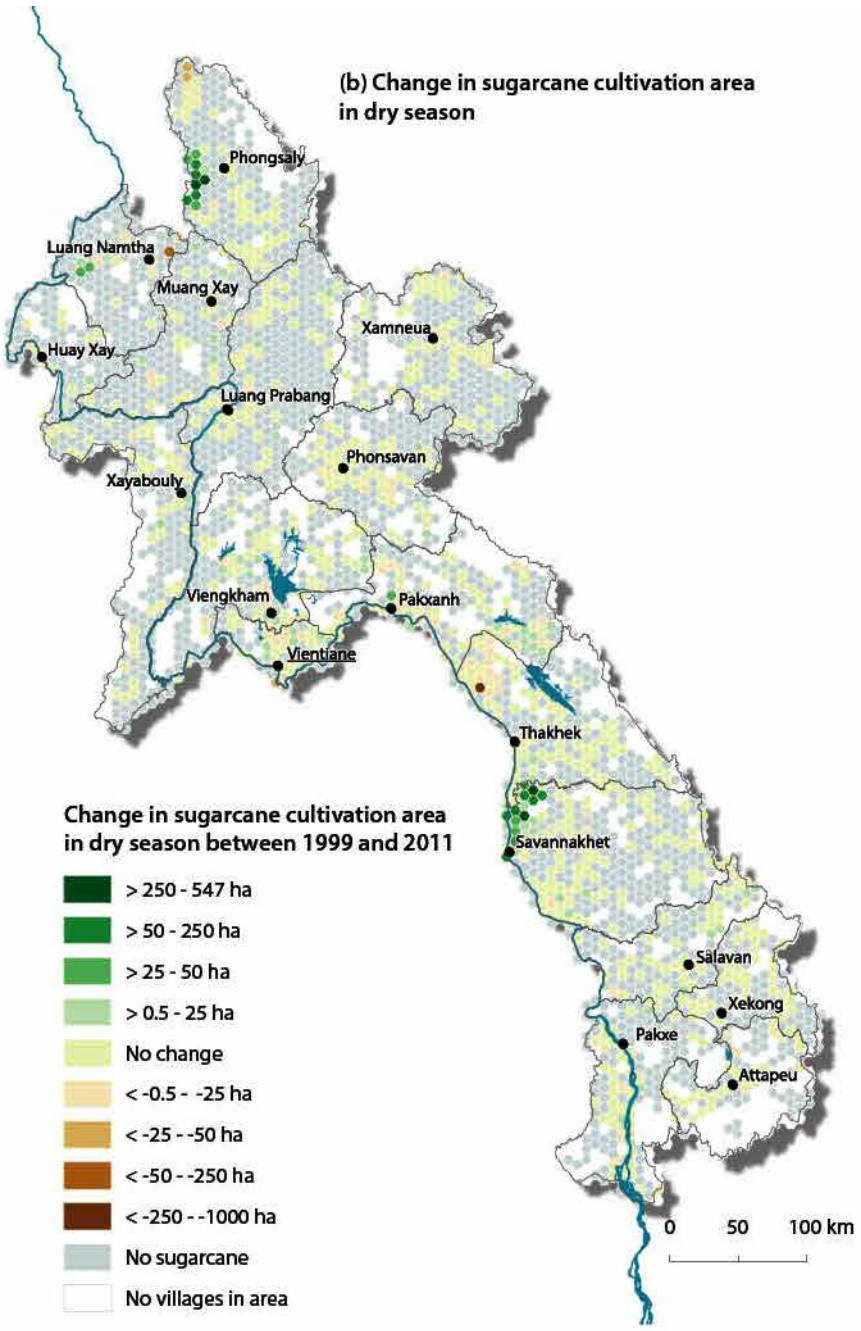
Interpretations

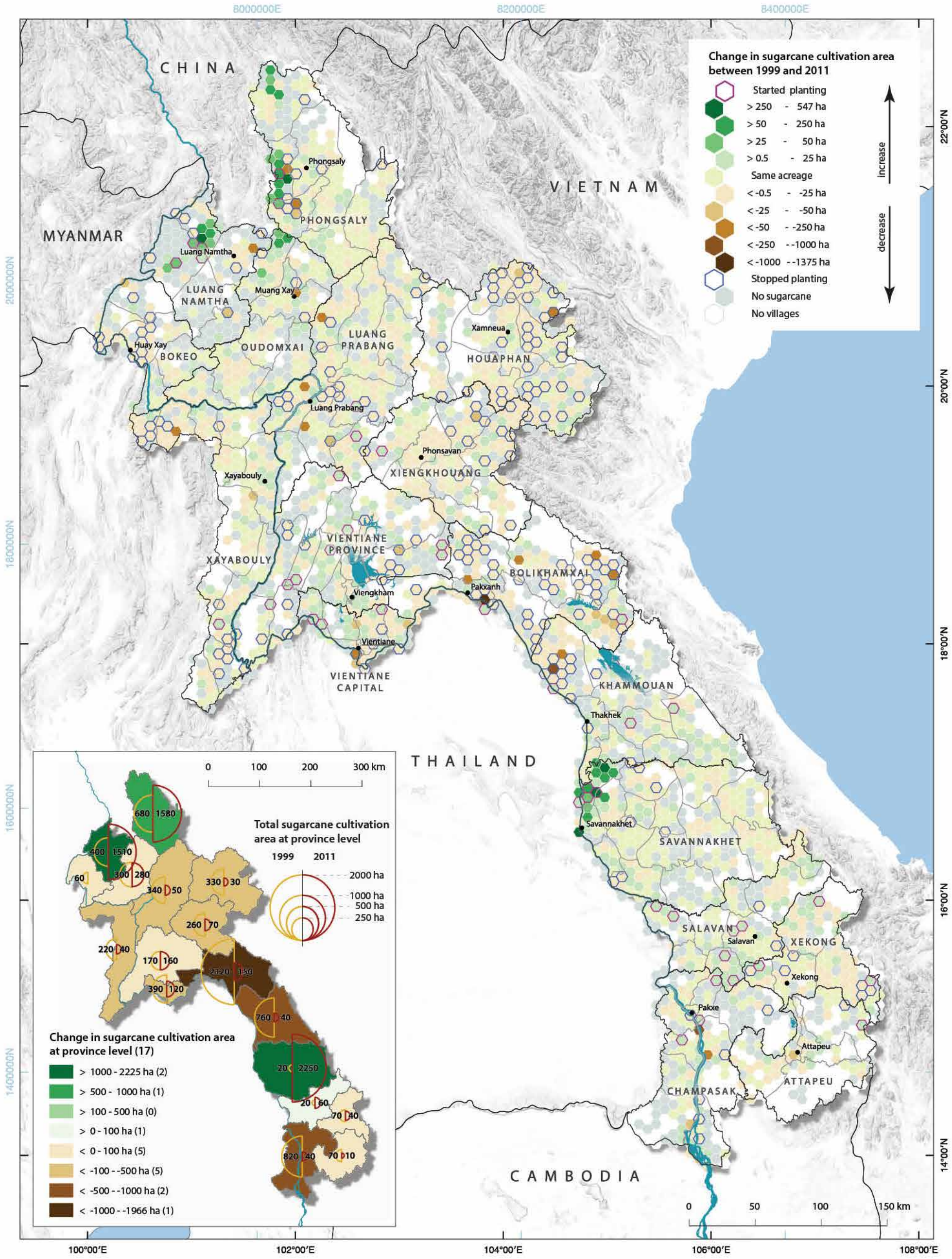
The decrease in sugarcane planted in Bolikhamxai between 1999 and 2011 was mainly the consequence of high demand on the Chinese market for cassava, which drove up prices for that crop. Most sugarcane production areas have been therefore replaced by maize or cassava (see C11 and C13), The decline in sugarcane production in Champasak, similarly, was the consequence of the expansion of coffee plantations (see C21), vegetables and other crops in that province.

In 2008, a sugar factory was established in Savannakhet by the Mitr Lao Sugar Company. The company engaged in 2+3 contract farming, a term used in the Lao PDR for a contract model in which farmers contribute land and labour (the 2 in 2+3), and the company provides inputs, technical advice and market access (the 3 in 2+3), for long-term periods of typically up to 40 years. In Savannakhet, sugarcane has since become a new income source for farmers (IUCN and NERI, 2011).

A similar contract farming model was implemented in Sing District, Luang Namtha Province, by a Chinese sugar factory (owned by YingMao Sugar Company). The factory provides financial and technical support to farmers through cooperation with the Sing District government. The district government has actively encouraged farmers to grow sugarcane, and in 2008 alone, Sing District exported 70,550 tons of sugarcane to China, with a market value of USD 1.6 million or about 8.7 percent of the district's total export value (Leebouapao and Voladeth, 2011). In the course of establishing sugarcane on this land, large areas of former shifting cultivation fallow have been turned into permanent agricultural land.






Change in sugarcane cultivation area between 1999 and 2011
Started planting
> 250 - 547 ha
> 50 - 250 ha
> 25 - 50 ha
> 0.5 - 25 ha
Same acreage
< -0.5 - -25 ha
< -25 - -50 ha
< -50 - -250 ha
< -250 - -1000 ha
< -1000 - -1375 ha
Stopped planting
No sugarcane
No villages
increase
decrease
CHINA
MYANMAR
VIETNAM
LAO PDR
THAILAND
CAMBODIA
PHONGSALY
LUANG NAMTHA
BOKEO
OUDOMXAI
LUANG PRABANG
HOUAPHAN
XIENGKHOUANG
XAYABOULY
VIENTIANE PROVINCE
VIENTIANE CAPITAL
BOLIKHAMXAI
KHAMMOUAN
SAVANNAKHET
SALAVAN
XEKONG
CHAMPASAK
ATTAPEU
Phongsaly
Luang Namtha
Muang Xay
Huay Xay
Luang Prabang
Xamneua
Phonsavan
Xayabouly
Viengkham
Pakxanh
Vientiane
Thakhek
Savannakhet
Salavan
Xekong
Pakxe
Attapeu
Total sugarcane cultivation area at province level
1999 2011
2000 ha
1000 ha
500 ha
250 ha
680 1580
400 1510
300 280
60
340 50
330 30
260 70
220 40
170 160
2120 150
390 120
760 40
20 2250
20 60
70 40
820 40
70 10
Change in sugarcane cultivation area at province level (17)
> 1000 - 2225 ha (2)
> 500 - 1000 ha (1)
> 100 - 500 ha (0)
> 0 - 100 ha (1)
< 0 - 100 ha (5)
< -100 - -500 ha (5)
< -500 - -1000 ha (2)
< -1000 - -1966 ha (1)
0 100 200 300 km
0 50 100 150 km
8000000E
8200000E
8400000E
22°00'N
20°00'N
18°00'N
16°00'N
14°00'N
2000000N
1800000N
1600000N
1400000N
100°00'E
102°00'E
104°00'E
106°00'E
108°00'E

C17 Sweet corn

Introduction

Sweet corn (*Zea mays convar. Saccharata var. rugosa*), also called sugar corn or pole corn, is a variety of maize with a high sugar content. Sweet corn is used for three purposes: human consumption, animal feed and industrial products (Kaiser and Ernst, 2010). Sweet corn varieties differ significantly by kernel colour, which can range from yellow to white to mixed colours. There are two varieties of sweet corn, the standard and the extra-sweet variety, both of which are considered high value. Sweet corn can also be distinguished by colour, as it occurs in yellow, white and mixed colours. Sweet corn is a popular fresh market vegetable and is picked when immature (milk stage) and eaten as a vegetable rather than a grain. Sweet corn can be sold fresh, canned or frozen.

In the Lao PDR, there are two different categories of corn. One is corn for human consumption including sweet corn and sticky corn (a local variety) and the other is called seed corn or feed corn which is mainly used as a feed grain for poultry farms, pigs and cattle (see C11).

Patterns of sweet corn cultivation in 2011

In 2011, there were 33,100 ha of sweet corn cultivated in the Lao PDR, of which 29,648 ha were planted in the wet season. Sweet corn is grown in 62 percent of all villages. It is predominantly grown in more mountainous parts of the country. In total, 44 villages devote more than 50 percent of their agricultural land to sweet corn. In some districts in Oudomxai, Xayabouly and Xiengkhouang, particularly large areas of sweet corn are grown (8,070 ha, 6,482 ha, and 4,209 ha respectively). These three provinces contain 57 percent of the total area under sweet corn. Table 4 gives detailed information about sweet corn cultivation across all provinces.

In total, 108,105 households plant sweet corn on 33,100 ha. Producers therefore cultivate an average of 0.3 ha per household, though the district level inset map illustrates that there are significant regional differences in the average area planted per household. In Phongsaly, for example, 12,693 households are engaged in sweet corn cultivation, which is the largest proportion (12 percent) of total agricultural households of any province. But the total area under sweet corn in Phongsaly is still relatively small at only 2,281 ha, because households only cultivate 0.2 ha on average (compare C13, C14 and C16). In contrast, in Xayabouly, 6,588 households farm 6,482 ha at an average of 1.0 ha per producing household. The highest average area planted per household is found in Kenthao District, located in the south of Xayabouly Province, where producing households have an average of 3.2 ha of sweet corn.

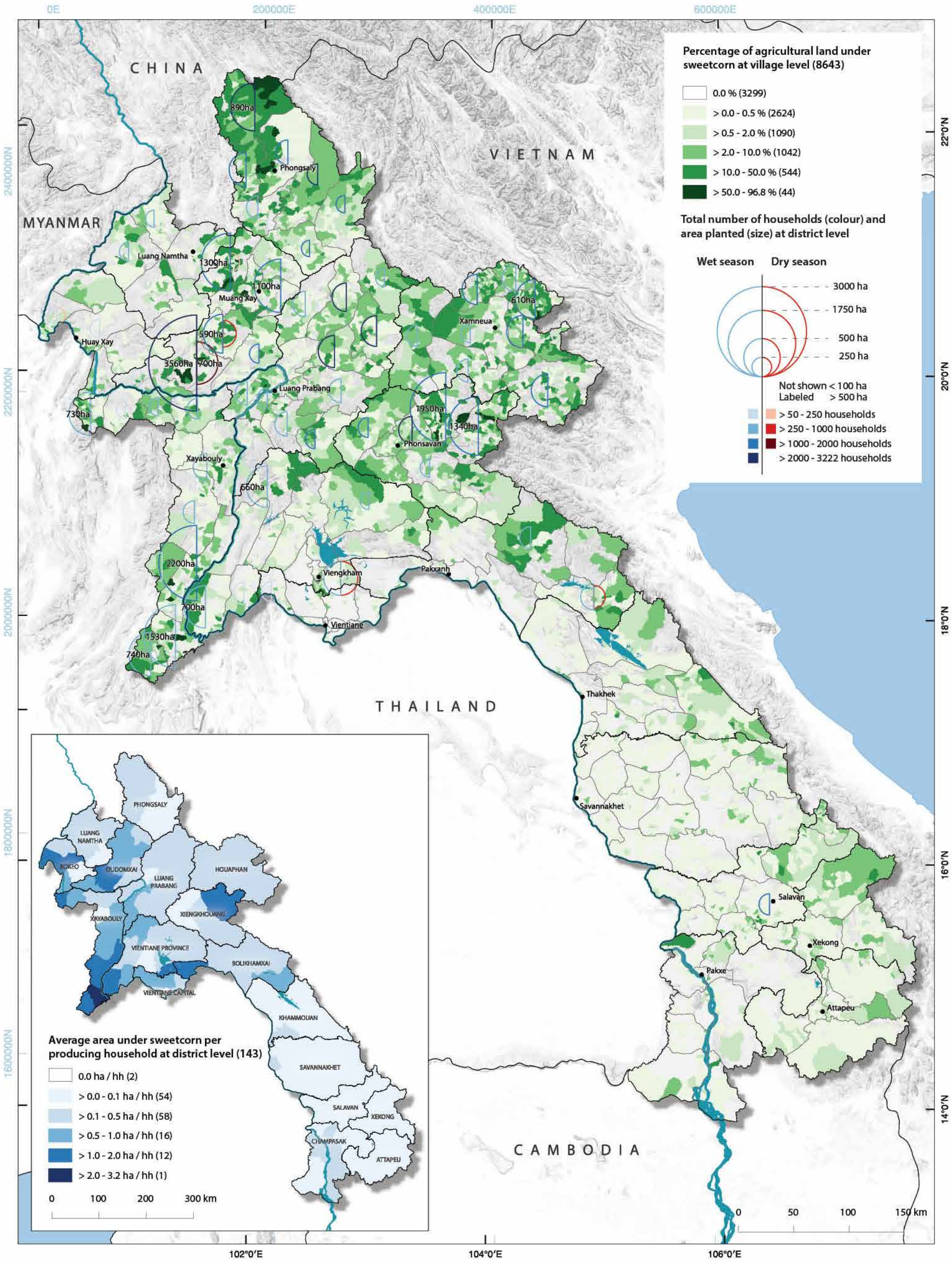
Potential and limitation for sweet corn production

Various studies point out that some lowland areas with irrigation facilities have changed from irrigated dry season rice to irrigated dry season sweet corn. Irrigated sweet corn production earns relatively good economic returns for farmers compared to irrigated dry season rice and consumes less water (Sourideth *et al.*, 2011). The labour requirements for sweet corn production are also much lower than for rice cultivation.

As a result, farmers in many areas such as Ban Keun in Vientiane Province, Ban Mouangkhai in Savannakhet Province and Ban Kokdeua in Champasak have abandoned rice production in the dry season and adopted sweet corn (Sourideth *et al.*, 2011). Sweet corn is suitable for a family with insufficient labour, but is an inappropriate option for households with a lack of investment capital. On the other hand, sweet corn production uses more fertilizer than typical rice production and can lead to soil degradation.

Table 4: Total area and percentage of sweet corn in the wet, the dry and both seasons in 2010/11

Province	Total ha sweet corn 2010 wet season	Sweet corn cultivated in 2010 wet season (% of total)	Total ha sweet corn 2011 dry season	Sweet corn cultivated 2011 dry season (% of total)	Total ha sweet corn 2010/11 both seasons	Percentage sweet corn 2010/11 both seasons
Vientiane Capital	232.1	77.3	68.1	22.7	300.1	0.9
Phongsaly	2,164.2	94.9	116.7	5.1	2,280.9	6.9
Luang Namtha	384.2	84.9	68.3	15.1	452.4	1.4
Oudomxai	6,883.5	85.3	1,186.4	14.7	8,069.9	24.4
Bokeo	418.1	59.1	289.6	40.9	707.7	2.1
Luang Prabang	2,610.4	98.3	46.1	1.7	2,656.5	8.0
Houaphan	2,586.6	97.5	65.9	2.5	2,652.5	8.0
Xayabouly	6,411.7	98.9	70.4	1.1	6,482.1	19.6
Xiengkhouang	4,110.6	97.7	98.8	2.3	4,209.4	12.7
Vientiane	2,208.3	78.5	606.5	21.5	2,814.8	8.5
Bolikhamxai	497.9	57.7	365.7	42.3	863.6	2.6
Khammouan	175.3	61.1	111.6	38.9	286.9	0.9
Savannakhet	128.8	40.1	192.1	59.9	320.9	1.0
Salavan	438.2	89.6	51.1	10.4	489.3	1.5
Xekong	121.3	92.3	10.1	7.7	131.3	0.4
Champasak	194.2	67.5	93.4	32.5	287.7	0.9
Attapeu	82.9	88.7	10.6	11.3	93.5	0.3
Total	**29,648.2**	**89.6**	**3,451.4**	**10.4**	**33,099.6**	**100.0**


Percentage of agricultural land under sweetcorn at village level (8643)
0.0 % (3299)
> 0.0 - 0.5 % (2624)
> 0.5 - 2.0 % (1090)
> 2.0 - 10.0 % (1042)
> 10.0 - 50.0 % (544)
> 50.0 - 96.8 % (44)
Total number of households (colour) and area planted (size) at district level
Wet season
Dry season
3000 ha
1750 ha
500 ha
250 ha
Not shown < 100 ha
Labeled > 500 ha
> 50 - 250 households
> 250 - 1000 households
> 1000 - 2000 households
> 2000 - 3222 households
CHINA
VIETNAM
MYANMAR
THAILAND
CAMBODIA
Phongsaly
Luang Namtha
Muang Xay
Huay Xay
Luang Prabang
Xamneua
Xayabouly
Phonsavan
Viengkham
Pakxanh
Vientiane
Thakhek
Savannakhet
Salavan
Xekong
Pakxe
Attapeu
890ha
1300ha
1100ha
590ha
3560ha
700ha
730ha
660ha
610ha
1950ha
1340ha
2200ha
700ha
1530ha
740ha
Average area under sweetcorn per producing household at district level (143)
0.0 ha / hh (2)
> 0.0 - 0.1 ha / hh (54)
> 0.1 - 0.5 ha / hh (58)
> 0.5 - 1.0 ha / hh (16)
> 1.0 - 2.0 ha / hh (12)
> 2.0 - 3.2 ha / hh (1)
PHONGSALY
LUANG NAMTHA
BOKEO
OUDOMXAI
LUANG PRABANG
HOUAPHAN
XIENGKHOUANG
XAYABOULY
VIENTIANE PROVINCE
BOLIKHAMXAI
VIENTIANE CAPITAL
KHAMMOUAN
SAVANNAKHET
SALAVAN
XEKONG
CHAMPASAK
ATTAPEU
0 100 200 300 km
0 50 100 150 km
2400000N
2200000N
2000000N
1800000N
1600000N
22°0'N
20°0'N
18°0'N
16°0'N
14°0'N
102°0'E
104°0'E
106°0'E