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Rice Production in Myanmar and Effects of Intensification on Crop Health



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**Rice Production in Myanmar and Effects of Intensification on
Crop Health**

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Zusammenfassung

Reis (*Oryza sativa* L.) ist das wichtigste Nahrungsmittel für die 51 Millionen Einwohner Myanmars (des früheren Burmas), von denen 75% direkt von der Landwirtschaft abhängen. Der Ertragsdurchschnitt des Landes stagniert auf dem relativ niedrigen Niveau von 3,2-3,4 t ha⁻¹. Eine Befragung und gleichzeitige Feldbonitur wurde während den Anbausaisons der Regenzeit von Juni bis September 2002 und von August bis Oktober 2002 durchgeführt, um die üblichen Methoden des Reisanbaus in Myanmar, die Inputs und die ertragsbegrenzenden Faktoren zu identifizieren. Bis zu fünf Kleinbauern pro Gemeinde wurden aus fünf Gemeinden der Region „Upper Myanmar“ (südlich Mandalays im Zentrum des Landes gelegen) und 16 Gemeinden der Region „Lower Myanmar“ (um Rangoon gelegen) in die Studie einbezogen. Die Auswahlkriterien dafür bildeten der Anbau der populären Reissorte Manawthukha und eine möglichst gute Erreichbarkeit der bäuerlichen Felder. Insgesamt wurden Daten mit Hilfe von 98 Bauern, die strukturierte Fragebögen beantworteten, erhoben. Die Fragen betrafen die Düngungspraktiken und Erträge der letzten 4-5 Jahre, das Anbausystem selbst, allgemeine Anbaupraktiken, bekannte und beobachtete Krankheiten und Schadinsekten, sowie Unkrautprobleme und gängige Kontrollmethoden. Zusätzlich wurde von jeweils einem Feld pro Hof sowohl die Befallshäufigkeit und Befallsstärke von Krankheiten und Schadinsekten bonitiert als auch der Ertrag erhoben.

Um die möglichen Auswirkungen verschiedener Intensivierungsszenarien auf die Reisproduktion zu quantifizieren, wurden zwei Experimente über sechs Anbauperioden in zwei Jahren von Mai 2001 bis Mai 2003 in Hmawbi (Lower Myanmar) und Yezin (Upper Myanmar) angelegt. Drei Anbausysteme mit den Kulturen Reis-Reis-Reis, Reis-Mungbohnen-Reis und Reis-Brache-Reis wurden in den drei Anbauphasen pro Jahr gegenübergestellt. In jedem System wurde der Einfluss der Strohverwendung (Einarbeiten oder Verbrennen) bei vier verschiedenen N-Düngungsstufen (i) 40kg N ha⁻¹ als Grunddüngung aus Hühnermist, (ii) Grunddüngung plus 2 x 20 kg N ha⁻¹ (Harnstoff), (iii) Grunddüngung plus 4 x 10 kg N ha⁻¹ und (iv) Grunddüngung plus 4 x 20 kg N ha⁻¹ ermittelt.

Der durchschnittliche Düngereinsatz im Reisanbau ging seit 1998 bis 2002 vor allem in der Regenzeit von 95 kg N ha⁻¹ auf 35 kg N ha⁻¹ zurück. In den letzten Jahren haben 35-40% der Bauern gar keine Düngemittel mehr angewendet. Auch die angewendeten P und K-Mengen nahmen proportional ab. Dies kann auf die schwierige ökonomische Lage der Bauern und des Landes zurückgeführt werden. Im Gegensatz dazu gab es keine solchen Rückgänge während der Trockenzeit, in der aber insgesamt weit weniger Reis als in der Regenzeit angebaut wird. Reis-Reis und Reis-Leguminosen (grüne Mungbohnen, *Vigna radiata* L. oder schwarze Mungbohnen, *Vigna mungo* L.) Anbausysteme dominierten unter den befragten Bauern. Nur wenige Bauern, alle aus Upper Myanmar, können drei Anbauphasen pro Jahr realisieren, z.B. Reis-Kichererbse (*Cicer arietum*)-Sesam (*Sesamum indicum* L.)

oder Reis-Mungbohne-Reis, da sie ganzjährig über Bewässerungsmöglichkeiten verfügen.

Die Erträge in Feldern, die keine Düngung erhielten variierten von 1,0-5,3 t ha⁻¹, während die Erträge in gedüngten Feldern zwischen 1,6 und 6,7 t ha⁻¹ lagen. Insgesamt waren die Erträge in Upper Myanmar höher als in Lower Myanmar. Maximalerträge in Upper und Lower Myanmar waren 5,7 bzw. 5,2 t ha⁻¹ in der Regenzeit und 7,6 bzw. 6,2 t ha⁻¹ in der Trockenzeit. Die Erträge der Felder auf denen drei Mal jährlich Reis angebaut wurde waren pro Saison signifikant höher als die der Felder mit zwei Anbauphasen. Dies ist möglicherweise darin begründet, dass die dreifach genutzten Felder in Upper Myanmar lagen, wo die klimatischen Bedingungen für den Reisanbau als insgesamt günstiger einzustufen sind. Ausserdem waren die Felder an die Bewässerung angeschlossen und der Zugang zum Markt war nah. Damit waren die Inputs in diesen Feldern auch insgesamt höher als in den Vergleichsregionen mit geringeren Erträgen.

Bezüglich der Krankheiten als ertragsrelevanten Faktoren wurden Bakterial Leaf Blight (BLB, *Xanthomonas oryzae* pv. *oryzae*), Sheath Blight (*Rhizoctonia solani*) und Sheath Rot (*Sarocladium oryzae*) regelmässig während der zweijährigen Befragung genannt und traten bei den Bonituren im Feld auf. Die Befallsschwere war immer leicht und somit kaum ertragsrelevant. Die Befallshäufigkeit, vor allem mit Sheath Blight erreichte jedoch häufig 100%. Ufra Nematoden (*Ditylenchus angustus*)- und False Smut (*Ustilaginoidea virens*)- Befall, riefen in einzelnen Gegenden vor allem in Lower Myanmar schwere Schäden hervor. An Schadinsekten verursachten insbesondere Gall Midges (*Orseolia oryzae*) in sechs der 2002 erfassten Gemeinden relativ hohe Ertragseinbußen.

In den zwei-jährigen (sechs Anbauphasen) Feldexperimenten trat Bacterial Leaf Streak (BLS, *Xanthomonas oryzae* pv. *oryzicola*) an beiden Versuchsorten in beiden Jahren in geringer Schwere auf. Die Krankheit beeinträchtigte die Erträge nicht. In der kühlen Trockenzeit 2002/2003 wurde jedoch in Yezin eine schwere Rice Blast Epidemie (durch *Pyricularia grisea* verursacht) beobachtet. Der Befall war auf allen Harnstoff Düngungsstufen signifikant höher als in der grundgedüngten Variante mit Hühnermist alleine. Dazuhin war der Befall auch in Parzellen, in denen das Stroh verbrannt worden war signifikant höher als in Parzellen, in denen Stroh eingearbeitet worden war.

In dieser Studie konnten keine eindeutigen Auswirkungen des Anbausystems auf die Erträge festgestellt werden. Während Harnstoff Düngung deutlich das Wachstum und die Erträge steigerte, waren gewöhnlich keine signifikanten Unterschiede zwischen den Parzellen in denen Stroh eingearbeitet oder verbrannt wurde zu sehen. Derzeit gibt es keine offensichtlichen wirtschaftlich relevante Probleme mit Krankheiten oder Schadinsekten im Reisanbau in Myanmar. Zukünftig wird es sehr wichtig sein, die Versorgung mit gesundem Saatgut zu verbessern, um samenbürtigen Problemen zu begegnen. Auch die oft sehr hohe Befallshäufigkeit mit Sheath Blight könnte sich

relativ schnell zum Problem entwickeln, sobald die ökonomische Situation höhere Düngerinputs zulässt.

Um die Langzeitauswirkungen erhöhter Düngergaben, verschiedener Anbausysteme und des Managements der Ernterückstände zu ermitteln, müssten die hier dargestellten Feldexperimente für mindestens zwei bis drei weitere Jahre fortgeführt werden.

Summary

Rice (*Oryza sativa* L.) is the most important staple for the 51 million people in Myanmar (formerly Burma) of whom 75% directly depend on farming. According to the national planning, rice yield per unit area is targeted to reach about 5.2 t ha⁻¹, but national average of rice grain yield is still stagnating at 3.2 – 3.4 t ha⁻¹. To identify yield constraints, input intensities and general practices of rice cultivation in Myanmar, a survey was conducted during the rainy seasons of June to September 2001 and August to October 2002. A total of 21 townships, five townships of Upper Myanmar and 16 townships of Lower Myanmar representing the most important areas of rice production in Myanmar were selected. Up to five farmers per township who cultivated the popular rice variety, Manawthukha and whose fields were easy to access were included in the survey. A total of 98 farmers were interviewed using structured questionnaires comprising questions on fertilizer use and yields during the preceding 4 – 5 years, cultural practices, the cropping system, observed diseases and pests and their control. In addition, yields, incidence and severity of diseases and pests were assessed in one field per farm.

To determine the possible effects of intensification on rice production, two multi-season field experiments were set up at Hmawbi (Lower Myanmar) and Yezin (Upper Myanmar) from May 2001 to May 2003. The effects of different rates and split applications of N (40 kg N ha⁻¹ via chicken manure as basal, basal + 2 x 20 kg N ha⁻¹ as urea, basal + 4 x 10 kg ha⁻¹, basal + 4 x 20 kg N ha⁻¹), crop residue management (2000 kg ha⁻¹ straw either incorporated or burned), and three cropping systems (rice – rice – rice, rice – greengram – rice, and rice – fallow – rice) on rice yield and disease occurrence were studied.

Since 1998, the average rate of fertilizer application decreased, especially in the wet season, from 95 kg N ha⁻¹ to 35 kg N ha⁻¹ in 2002. Application of P and K also declined proportionally. In recent years, 35 – 40% of the farmers did not use either mineral fertilizers or manure. This is due to the difficult economic situation of the farmers. In the dry season, however, there were no such decreases, but the rice area in the dry season is considerably lower than that of the wet season. Rice – rice and rice – legume (greengram, *Vigna radiata* L. or blackgram, *Vigna mungo* L.) cropping systems were the most dominant and only a few farmers from Upper Myanmar can grow three crops per year either rice – chickpea (*Cicer arietum*) – sesame (*Sesamum indicum* L.) or rice – blackgram – rice due to the availability of irrigation water for the whole year.